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CONTROL OF QUALITY OF PERFORMANCE AT A PRIMARY STOCK POINT IN THE U. S. NAVY'S SUPPLY SYSTEM

JAMES H. H. CARRINGTON

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CONTROL OF QUALITY OF PERFORMANCE AT A PRIMARY STOCK POINT IN THE U. S. NAVY'S SUPPLY SYSTEM

by

James H. H. Carrington
//
Bachelor of Science

U. S. Naval Academy, 1948

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Business and International Affairs of The George
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Master of Business Administration

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Thesis directed by

Karl E. Stromsem, Ph. D.

Professor of Public Administration

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PREFACE

Since graduating from the Naval Academy into the Navy Supply Corps in 1948, I have heard continual reference to the ineffectuality of the Supply System, particularly by line officers, but often by Supply Corps officers themselves. The complainers were often unable to cite specifics, when challenged, but in some cases examples offered were painfully illustrative of their point of view.

In 1960, a rotation of assignments brought me to the Naval Supply Center at Norfolk, Virginia. Here, the complaints were many, but vague; the causes of the problem sought for, but ineffectually. My first assignment was as Director of the Inventory Department. The purpose of the department was to conduct physical inventories and to report to management discrepancies encountered.

Discrepancies were, in fact, excessive, yet no action could be taken on the individual at fault because they had occurred so far in the past. In addition, the effect of these discrepancies on the efficiency of the command was unknown and uninvestigated, despite the many complaints received from the field and the Fleet.

In an effort to determine a method for ascertaining the discrepancy rate, its effect on the mission, and means for reducing

it, I attended the Statistical Quality Control course at the Army Ordnance Management Engineering Training Agency in Rock Island, Illinois; visited the regional mail order houses of Montgomery Ward in Baltimore and Sears, Roebuck in Atlanta; and spent two days at the home offices of these two firms in Chicago. Meanwhile, the Bureau of Supplies and Accounts, S-12 Division, had chosen Norfolk as a testing area for a revised inventory procedure which emphasized the use of a sampling technique and was aimed at the eventual replacement of inventory with a vigorous quality assurance effort.

As will be shown, this effort has not borne fruit, mainly because of misdirection. The Supply System continues to weather a storm of complaints and is in no position to deny the allegations nor measure their validity. This paper illustrates what the Navy is attempting to do, what industry is doing and what the Supply System might try as a solution to the problem.

The quantity of data is not strain'd,
It poureth as torrential rain from heaven
Upon the place beneath. It is twice cursed.
It curseth him that feeds and him that needs.
'Tis mightiest in the mightiest of commands.
The bus'ness monarch no more wears the crown
Nor sceptre wields as sign of temporal power,
That attribute to awe and majesty,
Wherein doth sit the dread and fear of kings.
No, data now controls the sceptre's sway
And can sow doubt into the hearts of kings
Unless they trust it just like God himself;
And power to managers will not be known
Unless the trust of quality is sown.

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CHAPTER I

INTRODUCTION

> Lorenzo: I pray thee,
> Understand a plain man in his plain meaning.[1]

The business of the Navy Supply System is to provide the operating forces with the means, in terms of supplies and materials, for carrying out their mission. This amounts to one of the world's largest businesses, and, as such, its solvency depends on the effectiveness with which it keeps these materials flowing to the users.

The activities within the system most involved with performing this function are the primary stock points, particularly the Naval Supply Centers and Depots. It is through these points that the majority of fleet and shore station requirements are funneled. And it is at these points that most of the items to fill these requirements are located.

The filling of these requirements poses a problem common to any large merchandising firm: that of furnishing the customer what he wants, when he wants it. The price, in the case of the

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[1] W. Shakespeare, The Merchant of Venice, Act III, Scene 5.

supply system, is measured more in time than in dollars, since the customer has no means to shop around. The actual filling procedure involves scores of steps and is the result of the efforts of hundreds of people. Despite improved methods of materials handling, automation of inventory control and processing procedures, institution of MILSTRIP,[1] and great strides toward better management techniques, supply people are still plagued by complaints that customers are not getting what they ordered.

Why they are not getting what they ordered (if, in fact, this is the case) is a matter of great concern to management. Admiral MacDonald, now Chief of Naval Operations, stated in 1962, when he was Commander of the 6th Fleet in the Mediterranean, that there was no acceptable percent defective in the logistics system when the combat readiness of a naval ship or aircraft is at stake.[2] As is shown in Chapters II and IV, there is, in fact, a percent defective.

Any system devised to seek out the cause of an error and effect a correction must concern itself with both methods and men.

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[1] Military Standard Requisitioning and Issue Procedure. This procedure resulted from joint effort on the part of Army, Navy, Air Force, Marine and Coast Guard supply personnel under the direction of the Department of Defense toward standardization of requisitioning and issue procedures used by the various services. MILSTRIP went into effect in July of 1962 and has been used ever since.

[2] Quoted by Captain Grover Clark, SC, USN, ComServ 6 Flt Supply Officer in a conversation with the author aboard U. S. S. Neosho, September, 1962.

No matter how accurate a method may be, careless people can cause errors. On the other hand, even the best employees can produce a faulty product if the method is not a good one.

The Navy Supply System's product is "Service to the Fleet." What insurance policy has supply management purchased to protect itself against the possibility of rendering its customers a faulty product? Chapter II discusses and illustrates the policy now in effect.

Industry's product, be it a part, an appliance, a suit of clothes or a service of some kind, is subject to the same type of error found in the Navy. Again, faulty people or faulty procedures are the main causes of errors. The large mail-order houses, like Sears, Roebuck and Montgomery Ward are similar, in many respects, to a primary stock point in the Navy. They fill a volume of orders daily; they use an order form similar to that used in the service; they must replenish their stock periodically; they have storage problems; they depend for their livelihood on effective customer relations--meaning giving the customer what he wants, when he wants it; and they accomplish all these missions through the use of hundreds of people.

Chapter III, Industry's Approach, examines not only what methods these two firms have hit upon to assure quality of product, but also the system adopted by manufacturing concerns--statistical quality control.

Chapter IV, A Proposal for the Navy, discusses the use of an inspection system similar to that of Sears' or Ward's, combined with the adoption of Statistical Quality Control methods by the Navy as a practical and inexpensive means for solving the problem. A specific procedure for the storing of material received from other supply officers is explained, and the results of tests performed by two major stock points are given.

Appendix B considers problems which may be encountered and which must be overcome if the program is to be accepted and of value to the activity. These problems will mainly involve people. Top management must not only be sold on, but must contribute to the program. Supervisors must recognize the value of the program to them. The working people must not feel that this is just another way for management to exploit them. All these problems relate to the manner in which the program is presented--and by whom. This appendix will touch also on some of the "fringe benefits" to be derived from a well-developed Quality Assurance Program.

The thesis of this paper is that:

1. The Navy Supply System has, in fact, an error rate detracting from the effective performance of its mission.

2. Efforts to reduce this error rate have not been effective.

3. Industry has the same problems and has made considerable progress, in some areas, to effect a reduction.

4. The Navy Supply System can borrow from industry methods which can be applied inexpensively and effectively to reduce the error rate.

Chapter V restates the thesis and evaluates the conclusions to be drawn from the investigation outlined in the intervening chapters.

> Portia: Live thou, I live. With much more
> dismay, I view the fight than thou that
> makest the fray.[1]

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[1] W. Shakespeare, _The Merchant of Venice_, Act III, Scene 2.

CHAPTER II

THE NAVY AND QUALITY

Portia: Let us go in;
And charge us there upon inter'gatories,
And we will answer all things faithfully.[1]

The American Society for Quality Control, founded in 1946, defines quality control as the maintenance of the "highest possible quality of product that is consistent with what the customer wants and is willing to pay for." Since this discussion is directed primarily at a service as the product of stock points, to fit the Navy Supply System this definition might read:

"Maintenance of the highest quality of service that is consistent with what the customer needs in order to carry out his mission, and for which it is within his means to pay."

Within this broad framework, what governs the control of quality of service in the military as a whole and, specifically, the Navy? The American Society for Quality Control did not even come into being until 1946. As is noted in Chapter III, specific attention was not given to quality control in industry until the middle 1920's. Harry E. Chesebrough, Vice President and Director

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[1] *Ibid.*, Act V, Scene 1.

of Quality Control for the Chrysler Corporation, pointed out in a speech in 1963 that the vocabulary of the auto industry 30 years ago did not even include the term "quality control." "The most we had was inspection," he said. "And the inspection was largely a matter of passing or rejecting the completed product."[1]

Inspection of the completed product will not assure today's customers' acceptance. Every part and process which goes into the final product must be subjected to some sort of inspection. The measurement or control of the human contribution to the process is normally performed by a supervisor.

> The importance of supervision or direct observation of a subordinate should not be neglected. Every executive below the apex of the hierarchy, whether he be a vice president or a foreman, is subject to supervision from a higher level. Observing a subordinate's behavior under various conditions is sometimes the best way to evaluate his performance or potential. Much of the process is informal and indirect and becomes an aspect of the socio-psychological dynamics of the superior-subordinate relationship. However, a superior cannot constantly keep watch over his flock if he is not to be overwhelmed with work. There are also good motivational reasons for not carrying supervision to an extreme. Accounting and other indirect control devices make possible a greater degree of decentralization and tend to give more personal freedom to subordinates. The control process generally involves some combination of supervision and indirect techniques.[2]

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[1] Clay Gowran, "Quality Control--New Key to a Good Car," The Washington Post, January 26, 1964, p. K-2.

[2] Henry H. Albers, Organized Executive Action (John Wiley & Sons, Inc., New York, 1962), p. 431.

Although Albert is referring to the supervision of subordinate executives, the problems of control of non-supervisory personnel are even more complicated and time-consuming, if only because there are more of them! The point here is that, aside from accounting and audit type controls, the only method the Navy has used over the years for controlling the quality of an individual's output has been through supervision at the first line level.

In a questionnaire to all the major stock points in the Navy Supply System, the following question was addressed to the storage officer[1] of each activity:

1. What is the estimated amount of time per day that a warehouseman performing a storage operation is actually supervised by his supervisor?

The answers varied from "two hours per day" to ". . . less than 20% . . ." to ". . . less than 45 minutes . . ." to "depending on the function to which the warehouseman is assigned and assuming that the term supervised is used to mean the warehouseman is within visual observation of the supervisor, time would range from minutes to the entire working day . . ." to "time is negligible in daily operations because warehousemen now average 20 years of storage experience." This last statement is

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[1] Storage Officer: officer in charge of receiving, storing, maintaining and issuing stock.

particularly significant because it seems to indicate that management has such trust in its employees, because of their experience, that it does not need to supervise them or check their work.

In a further effort to ascertain how much attention was being paid to inspection of the quality of a man's work or to the extent of training being applied, the following questions were asked:

2. What training techniques are used to keep storage warehousemen up to proper quality levels and who conducts the training?

3. What methods (if any) are used to assure the quality of work performed by storage warehousemen? (Inspection by supervisor, sampling, etc.)

The answers to these questions, taken together, would indicate that training of non-supervisory personnel is conducted, in the main, by the leadingman[1] or stockman[2] in charge of the employees. This consists of on-the-job training, for the most part. Quality checks, such as they are, take the form of spot checks, occasional sampling, and reaction to customer complaints. At NSC, Norfolk, sampling is performed by an independent Quality

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[1] First-line supervisor.

[2] Non-supervisory position between working level and leadingman. Often assumes leadingman's job.

Assurance unit, but, like the reaction to customer complaints, attempts at correction are, in the words of Commander James McKenna, director of the Storage Division at the Naval Supply Center, Norfolk, "too late to do any good!" He refers to the problem of not being able to relate the mistake to an individual, or, if this is able to be accomplished, the individual's not being able to remember the item, incident, etc.

The quality of the performance of an individual, then, is still very much the responsibility of the supervisor, and, as Albers puts it, he will be ". . . overwhelmed with work . . ." if he tries to keep constant watch over his flock and all their output.

But is this in keeping with broad Department of Defense policy or philosophy? Speaking of quality control in terms of its engineering context, John Riordan of the Office of the Assistant Secretary of Defense (Supply and Logistics) states:

> The quality control function is managed in accordance with certain basic principles laid down by the Assistant Secretary of Defense. Among these principles are the following:
>
> 1. Quality control management pertains to all materiel entering supply channels. Thus, the management function encompasses all supplies and equipment that are procured, maintained and stored by the Department of Defense.
> 2. The management function is directed not only toward preventing defective materiel from entering the supply system, but equally important, it is designed to improve productivity and to achieve economy in production.

> 3. The objectives of quality control are achieved most effectively by collaboration with, rather than by duplication of, similar activities of industry.
>
> 4. The Department of Defense retains exclusively both the right and the responsibility to make final decisions regarding the acceptability of products proffered by suppliers to the Department.
>
> 5. The ultimate measure of the effectiveness of a quality control program is reflected in the performance and reliability of products in service.
>
> The above principles are necessarily in capsule form. They indicate broadly, however, the background of ideas and objectives within which specific policies are formulated.
>
> It is to be noted that the Office of the Secretary of Defense has firmly adopted the point of view that quality control must be managed as a total function; that is, a function that encompasses all activity that directly affects the quality of products delivered to the Air Force, Army and Navy combat forces. More precisely, as applied to the operations of the Department of Defense, this point of view means that quality control must take equal cognizance of the quality of products in storage, the quality of products that emerge from maintenance operations, and the quality of procured materiel.[1]

The basic document outlining Department of Defense policy with regard to quality control of materiel procured from industry is Quality Control System Requirements (MIL-Q-9858).

> Like a living organism, a QC program needs more than arms and legs to get on with its work. . . . It was to be expected, then, that the Department of Defense should publish a document which defines the nature of a satisfactory quality control system. This document has been published as MIL-Q-9858. The specific purposes of MIL-Q-9858 are as follows:
>
> 1. To assure control of all manufacturing operations;
>
> 2. To establish control of the quality of incoming materials and components;

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[1] John J. Riordan, "Quality Control Management in the Department of Defense," Industrial Quality Control, December, 1959.

3. To provide for inspection and testing during manufacturing and prior to shipment;
4. To establish procedures for control of nonconforming materiel and supplies;
5. To provide for correction of the causes of substandard quality.[1]

It seems that the key to policy considerations of Quality Control at the Department of Defense level is inspection of quality assurance programs in industry, for procured items, and insistence on quality of stored and maintained items already in the system. "The military is not interested in a defective part as much as it is interested in the system which produced the defective part. . . . Further, . . . the military feels that the best way to avoid a recurrence is to find the hole in the system and plug it.[2]

It would appear, then, that if the Department of Defense is insisting on quality control systems _without_ the military, it most assuredly would insist on the same requirement _within_ the military.

The following quotation from an article by Major General Webster Anderson, Commanding Officer of the Military Textile and Clothing Supply Agency, indicates that this philosophy has filtered down at least as far as the inventory control point level.

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[1] _Ibid_.

[2] J. J. Daly, "Two Magic Words," _Industrial Quality Control_, November, 1961, p. 11.

> One approach (for improving quality) we have taken is to place the responsibility for quality control on the contractor himself; that is, the manufacturer. This may sound like a very naive statement, but where else does it belong? Until very recently, the contractor was not responsible for quality--we were! When we bought materials, our laboratory was responsible to see that they met our specifications. When he built clothing, our inspectors were responsible for his quality. . . . Then three years ago came contractor testing; that is, we required the contractor to test his materials against our specifications and to submit to us the results of these tests. By check-testing we assure the comparability of his laboratory with ours. This procedure has had the remarkable effect of reducing substandard material by 50 percent. . . . Any supplier . . . who can demonstrate to us that he has an effective statistical quality control program operating in his plant is exempt from furnishing test results for each lot of items he furnishes to our contractors. . . . In other words, the contractor, who has always been held responsible for making the item according to specification requirements, is now responsible for testing and examining it for conformance to these requirements. The government inspector's role is now that of assuring that the contractor has properly performed and documented his inspection.[1]

Like programs are in effect in other Defense Supply Agencies. But what of production activities within the Department of Defense? What quality assurance programs are in effect there to carry out the philosophy expressed by John Riordan as that of Department of Defense.[2]

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[1] Webster Anderson, "A $2,000,000,000 Quality Operation," Industrial Quality Control, October, 1960, p. 7.

[2] Riordan, Industrial Quality Control.

> [illegible]

[illegible]

[illegible]

The Bureau of Ships, for one, has instituted a vigorous program designed to fulfill the desires and reach the goals set by the Secretary of Defense. In A Guide to Quality Assurance in Shipyards, published in January of 1964, the Foreword states:

> Many volumes have been written about Industrial Quality Control, Statistical Quality Control, Total Quality Control, etc. Usually such volumes contain from 400 to 600 pages of erudite information applicable mainly to mass production plants. Such texts also contain good basic principles of quality control; however, the size of volumes and their principal concern with mass production discourage busy shipyard managers from extracting those principles and analyzing their application to shipyard operations.
>
> This guide, produced by shipyard personnel for shipyard personnel, contains all the basic principles to shipyard operations and problems.
>
> With the increasing emphasis which quality assurance is receiving at all levels of government administration, it behooves all Engineering Duty Officers and senior shipyard and Supervisor Shipbuilding civil service personnel to have an understanding of how quality assurance does apply to shipyard operations and how to manage a program of uniform quality assurance within a shipyard.
>
> Although this guide was developed as a part of the Bureau's Quality/Reliability Assurance Training Program, which was designed for Quality Assurance Engineers, this guide does contain in concise form all the information that most Engineering Duty Officers need. Those Engineering Duty Officers and shipyard civilian personnel directly involved in Quality/Reliability functions should supplement this guide with one or more of the many training courses available.[1]

This requires shipyard managers to implement the policy of the Bureau.

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[1] NavShips 250-706-34, A Guide to Quality Assurance in Shipyards, (Washington, D. C.: Navy Department, Bureau of Ships).

The scope of the manual provides the reader with information as to:

> (1) What quality assurance is;
> (2) Why it is necessary;
> (3) How a quality assurance program should and can be administered in a Naval shipyard or by SupShip office for a private shipyard; and
> (4) Against what background the quality assurance directives were developed and implemented. Subsequent chapters discuss significant elements of a quality/reliability assurance program in detail.[1]

The Guide is well organized, well written and should produce excellent results in keeping with Department of Defense policy. But, again, this is aimed at production or manufacturing type work.

The Bureau of Supplies and Accounts does not deal at all with manufacturing, but BuSandA activities handle a great deal of material, in a production sense, in their receiving, storing, assembling, packaging, packing and addressing functions, and these activities are susceptible to a quality control approach. In addition, any clerical act which affects the disposition of an item is a target for a quality assurance system. What has BuSandA done, specifically to implement such a program?

As a result of inventory testing performed at the Naval Supply Center, Norfolk, on March 15, 1962, the Bureau of Supplies and Accounts circulated BuSandA Notice 4440, which requested

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[1] Ibid.

comments concerning a proposed BuSandA Instruction, the subject of which was: Improvements in Physical Inventory Operations. Enclosure (5) to that proposed instruction is included as Exhibit 1. This enclosure proposed the eventual elimination of the physical inventory system in its current form and the substitution of an aggressive quality assurance program to eliminate errors before they occurred. Audit and sampling procedures were recommended at key points in the system to pick up errors and trace them to their source.

When the comments were evaluated and the thinking revised, BuSandA Introduction 4440.91 was issued on June 1, 1962. The wording was practically identical to that of the proposed instruction except that practically all reference to quality control and to the Quality Assurance Program, including Enclosure (5), was eliminated. The emphasis was on the statistical sampling features of physical inventory and location audit. The design appeared to be toward a policy of continuing to try to locate errors and correct them after the fact instead of establishing a system of preventive medicine--"finding the hole and plugging it."

On October 25, 1963, a Speedletter was distributed to all BuSandA-managed activities, the subject of which was "Suspension of Regularly Scheduled Physical Inventories."[1] This notice

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[1] BuSandA Notice 4440, October 25, 1963.

provided, in lieu of statistical sampling inventories prescribed by BuSandA Instruction 4440.91, for

> . . . a spot inventory to be conducted when any of the following are encountered:
> 1. Warehouse Denials.
> 2. "Zero" balance condition on stock records.
> 3. Referral Orders.
> 4. Known or suspected imbalance between material assets and stock record balance of individual items.

The taking of physical inventories is a costly business. The results, at this point, did not warrant the expense.

Meanwhile, though progress of quality control from its original genesis in the physical inventory program had virtually ceased, the term "Quality Assurance" had caught on. Although the ". . . effective quality control program to be promulgated by a separate BuSandA Instruction bearing an effective date of 1 September 1962 . . ."[1] has never been forthcoming, the basic instruction (4440.91) called for the establishment of a Quality Assurance Division within the Planning and Comptroller Department. This has further been reflected in the revised organization chart for a Supply Center or Depot. Consequently, the seed planted in Norfolk in 1960, though it has not grown in the intended direction, has resulted in some stirring of the managerial soil to the extent that the word "Quality" has become of some concern.

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[1] BuSandA Instruction 4440.91, June 1, 1962.

Because attention will be devoted to the storage operation in particular, the following questions were asked of the Planning Officers of the various commands to which questionnaires were sent:

1. To what extent is the Quality Assurance Program ensuring the accuracy of location information for incoming material?

2. What is the current percent defective of locator information?

The answer to question number two varied from 15% to 0.15% to ". . . this information not available." (four cases)

To question number one, with the exception of NSD's Yokosuka and Newport, the commands responding generally indicated that the program was not yet in effect or that the introduction of UADPS[1] plus a complete wall-to-wall locator audit were expected to eliminate the problem. However, if a warehouseman follows every correct procedure in storing an item but puts the item in the wrong bin, no computer can tell management of the error--and the mistake could occur the day after the wall-to-wall audit is completed.

The Naval Supply Center, Oakland, faced with the continuing problem of customer complaints about receiving the wrong material, receiving the right material too late, or not receiving material at all, published, in its September edition of the Pacific Supply

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[1] Uniform Automatic Data Processing System. A system being applied to the entire Navy Supply System network.

Letter, its policy of attacking the quality problem by encouraging customer comments through post cards to be submitted to its Quality Assurance Division, quality "checks" internally, sampling of production, and controlling and auditing wherever practicable to pick up errors and correct them. Meanwhile, the Center is preparing for the installation of the UADP System--and is aware of the problems faced by other commands already seized by the growing pains of this intricate process.

Recognizing the limitations of inexperienced personnel and the probability of the situation worsening before getting better, the Commanding Officer of NSC, Oakland commissioned Arthur D. Little, Inc., a consulting firm, to examine the Center's procedures. Because of their experience with the Navy's Ship's Parts Control Center in Mechanicsburg, Pennsylvania, the A. D. Little team, in consonance with Center personnel, began work in August of 1963 in areas affecting transaction reporting. Dr. Bernhard W. Romberg, heading the team, stated, in Working Memorandum No. 1, dated October 14, 1963:

> In a continuation of its work in Quality Control in Data Processing and at the invitation of the Commanding Officer, Arthur D. Little, Inc. has undertaken to assist NSC, Oakland in its work in this area. As part of this program, the ADL team, together with BuSandA representatives, first visited NSCO in August 20-23, 1963. At that time, they made several presentations describing their scope and objectives, approach, and previous work for the Navy. They also obtained overall views of much of the operation at NSCO and met separately with Navy and civilian personnel to answer questions and discuss matters of particular interest. In that visit it was

> generally agreed that ADL would begin work in Receipt Control and quickly branch out to related areas of transaction reporting and requisition processing. The ADL team would work closely with members of the Systems and Procedures Division, which is part of the Planning and Controllers Department.[1]

Coincidentally, at the Navy Supply Center, Norfolk, in 1961, the initial efforts in quality assurance by the Inventory Department and Bureau of Supplies and Accounts personnel were directed toward the receiving procedure as the obvious place to start with any quality control effort. The Receipt Control section of Dr. Romberg's report is enclosed as Appendix A. One significant comment by Dr. Romberg follows:

> A Receipt Control suspense file as a control on stowage is an excellent idea. What we have at NSCO is not an improper application; rather it is an improperly functioning control system. The control system itself is grossly out of control--in fact, more so than the system it is to control! Our first job then must be to make the control system operate properly--to bring it into control. _After_ this is done, it can be used as a control on stowage--not before.[2]

Here was a case where an effort to control had been made, but the results were, to say the least, disappointing. The controls were so out of control (20,000 unmatched documents in three months!) that no notion of the condition of the _process_ could be estimated.

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[1] Bernhard W. Romberg, "Working Memorandum No. 1," (New York: Arthur D. Little, Inc., October 14, 1963).

[2] _Ibid_.

What Dr. Romberg recommended was a control system, utilizing check points and management-by-exception principles--but in an expensive application; and what he is really proposing is a control on the control.

The problems experienced at Oakland are not unique. The same ones exist, in one form or another, at all stock points, particularly the larger ones. Norfolk, as an example, recognized it had a real quality problem during the 1960-1961 period when the term Quality Assurance began to "catch on" because of the experiments being conducted in the Inventory Department. On July 24, 1961, NSCNORVA Instruction 4855.2 established a quality assurance goal, and, in effect, reiterated the fact that it was the business of everybody at NSCNORVA to be quality conscious.

The Material Department,[1] meanwhile, had instituted a Quality Assurance Program in the Storage and Services Divisions, complete with flow charts, statistical sampling, and control charts. The plan had two distinct disadvantages, however: it was not devised by trained personnel with sufficient time to investigate all the alternatives, and there was no staffing provided to implement it. Despite these objections, the very fact that a control was present had a startling effect on the personnel concerned, and the product improved remarkably--perhaps due, in

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[1] The department concerned with warehousing and packing operations, primarily.

some part, to the fact that management was taking a greater interest in them, apropos of the Hawthorne study. An example of this effectiveness was the fact that during the short duration of the trial (a little over four months) over seventeen miles of tape were saved in the packing operation.[1] The program was suspended when a reduction-in-force took away what staffing the department had been able to devote to it.

Meanwhile, the Inventory Department had been absorbed into the Planning and Comptroller Department, the "counters"[2] being transferred to the Material Department, though their function was still controlled by what had now become known as the Quality Assurance Division of the Planning and Comptroller Department. This arrangement was unsatisfactory, it was apparent, and the counters returned to Quality Assurance where they were engaged in conducting location audits. At the same time, efforts were being made to establish quality control inspector positions in the Service Division (Packing and Preservation). Quality was still on management's mind, but competent people to implement an integrated program were not available.

Finally, in October of 1963, NSCNORVA Instruction 4855.2A established a Quality Assurance Program which defined quality

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[1] Statistics made available by the Services Division, Material Department, Naval Supply Center, Norfolk, Virginia.

[2] The personnel permanently assigned to taking inventory.

assurance as ". . . the development, implementation and evaluation of techniques designed to measure, improve and control the quality of work performed by individuals, groups or organizations within the Naval Supply Center." The program, based on statistical sampling and including a proposal to utilize a control chart for percent defective is now in its initial stages. Exhibit 2 contains illustrations of what areas are being subjected to scrutiny and what methods are being used. To sum up these projects: statistical sampling for inventory purposes, or determining error rate and type of error--significant steps in the direction of an effective quality control program. What else has Norfolk been doing?

To give emphasis to the subject of quality, in September, 1963, the Command inaugurated "Operation Storekeeper," the goal of which was "a positive and specific program for sustained improvement in the Quality and Accuracy of our operation."[1]

The program pointed to the lack of physical inventory and the mass migration of items to new inventory managers as the principal causes for the increase in warehouse refusals, the increase in adjustments between stock on hand and recorded, and the decline in support effectiveness. The operation included a promotional effort in the form of an illustrated pamphlet plus

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[1] "Operation Storekeeper" manual, NSC, Norfolk, Virginia

The Pelican Press

Volume 1—No. 23 NAVAL SUPPLY CENTER, NORFOLK, VA. 24 January 1964

Storekeeper, Material Join Forces To Fight Mistakes

SAMPLES TAKEN . . . Ben Lahay and George Green (above) take samples while looking for mistakes as part of Quality Assurance's Operation Storekeeper project. THE RESULTS . . . These are the results of the sampling shown being taken above.

Operation Storekeeper has found a friend! At the invitation of Material's director, CAPT O. J. Brosseau, Storekeeper was asked to run random samples for error rate in the Parcel Post packing section. Although packing was the main target, error rate of bin pickers was also checked.

Quality Assurance Division of P&CD, father of Operation Storekeeper, ran 185 package samples and came up with 12 discrepancies for a total of 6.5% error overall.

In the packing end of the operation, it was found that improper use of containers was the big culprit, with nine errors for a total of 4.9% errors. In this area items were packed in cartons that should have been in jiffy bags and vice versa. One Quality Assurance employee remarked, "Considering that about 2,500 packages move through here a day, it's not impossible that eventually a person could start trying to pack molasses in a paper bag."

Of 253 issue samples in the bin picking category, five errors were found for a 2% discrepancy. The percentage of discrepancy was considerably lower this time than when the last sampling was taken.

CAPT Brosseau, when queried about the findings commented, "This is exactly what we want to know in Material Department; where we're making costly mistakes, who is making them, and what we can do to correct them. Look at the samplings on the bin pickers! The last time the figures were high . . . in fact, very high.

coverage in the house organ which stressed the effect of poor quality and lack of accuracy on the customer and new emphasis on quality assurance as a corrective measure. (Illustration p. 24)

This new emphasis was supported by additional personnel being assigned to the Quality Assurance Division plus expansion of the quality program to more sensitive areas.

One application of particular interest was to the Command's "Operation Restow." This operation involved the physical transfer of more than 75,000 line items of electronic parts from one building to another and represents the only application of quality assurance to a storage procedure attempted thus far. In the strictest sense, the project was a monitoring rather than a controlling effort, since acceptance sampling was not attempted, nor was a statistical control in the form of control charts utilized. However, the samples were taken daily on a random basis, the sample being selected by the computer, and the errors brought to the immediate attention of the personnel concerned. The average error rate, in terms of mistakes concerned with actual location of material or the recording of location information, for this tremendous movement of stock amounted to only 1.72%. The accuracy of this operation has been attributed largely to the quality measures taken. The following are actual statistics:[1]

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[1] Obtained from QAD records at NSC, Norfolk.

Total population	75,760 line items
Total sample	7,576 line items
Total errors*	130
Percent defective	1.72

*Affecting issue

What management effected, here, was an inspection program similar to that utilized by industrial activities. (See Chapter III) The application, however, was to a "one-shot" operation. The techniques, although not exactly similar to those recommended later in this paper, should have indicated to management that immediate discussion of errors with individuals concerned will provide the most significant rewards in a program of this nature. Prior and subsequent applications at Norfolk have not included this vital requirement, according to Commander McKenna.

Future plans at Norfolk call for application of statistical quality control techniques with the utilization of control charts for percent defective. Efforts at this command are definitely slanted toward improvement of quality, utilizing statistical methods.

Although Norfolk seems to have taken the lead, the other stock points have also established quality assurance functions.

The emphasis remains in the area of after-the-fact correction rather than preventive medicine, however. Is this the approach taken by industry?

> SHYLOCK: I am not bound to please thee with
> my answer.[1]

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[1] W. Shakespeare, The Merchant of Venice, Act IV, Scene 1.

CHAPTER III

INDUSTRY'S APPROACH TO THE PROBLEM

Portia: He is well paid that is satisfied.[1]

As has been mentioned before, poor quality means virtual bankruptcy to an industrial firm. Today, customers are too educated to buy an inferior product. There are exceptions, of course, but by-and-large, today's consumer wants to know a lot about the performance of what he buys. By the same token, he will not accept poor service.

Customers--both industrial and consumer--have been increasing their quality requirements very sharply in recent years. This tendency is likely to be greatly amplified by the intense competition that seems inevitable in the near future.[2]

Even the housewife in our modern society is schooled (or spoiled) enough to demand the highest quality of goods and services. To survive, industry has responded by studying its internal procedures and methods in an effort to build quality into its product.

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[1] Ibid., Act IV, Scene 1.

[2] Armand F. Feigenbaum, "Total Quality Control," Harvard Business Review, (Nov-Dec., 1956), p. 93.

The education of the consumer started to reach significant proportions with the advent of mass production and has been growing ever since. Mass media of communications have enhanced its growth to the extent that today's woman driver may be seen instructing a garage mechanic on how best to clean and gap a set of spark plugs or explaining the difference between 20 weight and 30 weight oil. The "customer is always right" today means that he knows not only what he wants but knows what he is talking about in a technical sense.

In the middle 1920's industry began to experiment with various methods for insuring that its products met the customer's specifications. The booming automotive, textile and meat-packing industries, in particular, found that one hundred percent inspection of every item coming off the production line was not only too costly and time-consuming but that the results were not at all satisfactory. How could one tell, in any detail, the quality aspects of a completed Buick as it came off the paint rack?

The answer was that each part that went into that automobile had to be inspected to be sure that it was within the tolerances set by the engineers. But, if it were a piece of metal with a flaw in it, how could this be detected with calipers? Again, the metal itself had to undergo tests to see if it was up to specifications. And what about the specifications and tolerances themselves? Were the engineers infallible? Were the methods and procedures used to produce the products error-free?

In 1924 the first experiments in acceptance sampling were conducted with a view toward reducing the cost while maintaining accuracy and range of inspection. Based on statistical probability techniques, the premise was that the percentage of defectives in a sample of a lot (of products) was indicative of the percentage of defectives of the entire lot, the accuracy of the estimate depending on the size of the sample and its randomness. A further premise was that:

> Measured quality of a manufactured product is always subject to a certain amount of variation as a result of chance. Some stable "system of chance causes" is inherent in any particular scheme of production and inspection. Variation within this stable pattern is inevitable.[1]

As long as the variations remained within the tolerances set by the specification, there was no "defective" present. Chance exceptions constituted defectives, but as long as they were within an acceptable percentage, it was presumed that the lot was acceptable and could be shipped to the customer.

What started in 1924 as an experiment became accepted practice practically overnight, and acceptance sampling today has almost completely replaced one hundred percent inspection in all industrial firms.

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[1] E. L. Grant, Statistical Quality Control, (New York: McGraw-Hill Book Company, Inc., 1952), p. 3.

An outgrowth of acceptance sampling was the control chart technique[1] of analyzing processes to see if they were or were not "in control."

> . . . A control chart has been likened to a highway in that a highway of a certain width must be maintained to accommodate the necessities of driving vehicles. The width of the pavement necessary for a car is different from that needed for a span of mules hitched to a hayrack, although each width can probably be determined in a fairly accurate manner.
>
> In order to see more specifically the relationship between a highway and a control chart consider Figure 1 and Figure 2 together with the diagram shown in Figure 3. It will be observed that the pavement corresponds to the green of the safety zone. Along either side of the pavement is a shoulder referred to as the yellow or caution zone, while beyond the shoulder is the ditch referred to as the red or danger zone. The pavement or safety zone should be of a certain width in order to satisfy the needs. This width depends again on the vehicle or the mode of transportation. For economy it should be set so that one is safe to be upon the road. It is unnecessary that it be otherwise. In fact, width is determined by the vehicle and drive being used; that is, by the process. The edges of the pavement are represented by control limits. Should a wheel of the car get off the pavement (outside a control limit) then action should be taken in order to bring it back into control, or the result may be disastrous. The boundary between the shoulders and ditch represents the specification limits. It is necessary to keep individual parts within these limits in order to avoid the production of scrap. This can be done by keeping the process in control and by taking specific action when plottings occur outside the control limits.
>
> The control chart is thus a picture or a photograph of the process, and it should be placed near the machine of operation. The chart represents an advertisement for the worker of what he is doing. It is easy to follow and relatively simple to interpret.[2]

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[1] The classic text in the field was W. A. Shewhart, Economic Control of Quality of Manufactured Product (New York: D. Van Nostrand Co., Inc., 1931).

[2] Lloyd A. Knowler, "Fundamentals of Quality Control," Industrial Quality Control, July, 1946.

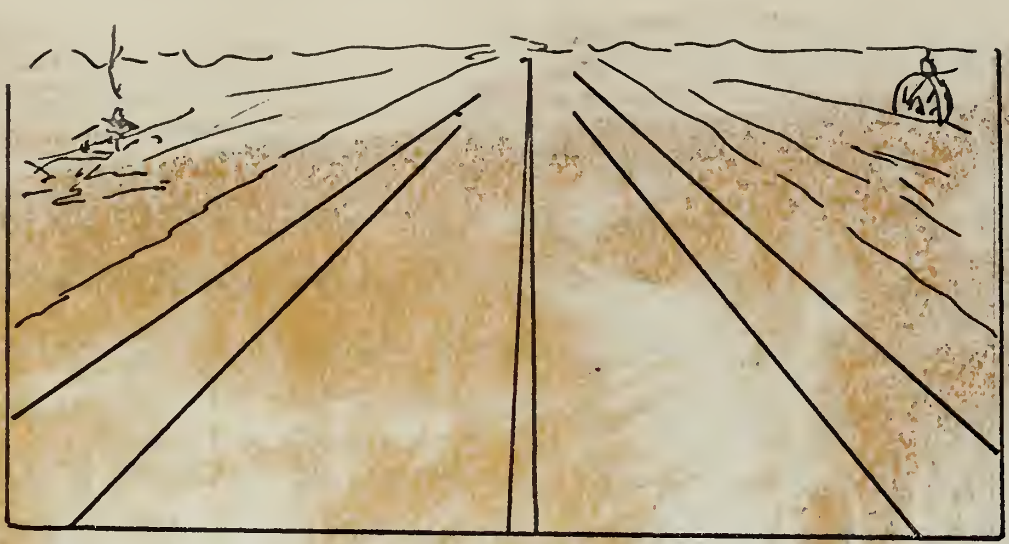

Figure 1

PICTURE OF HIGHWAY

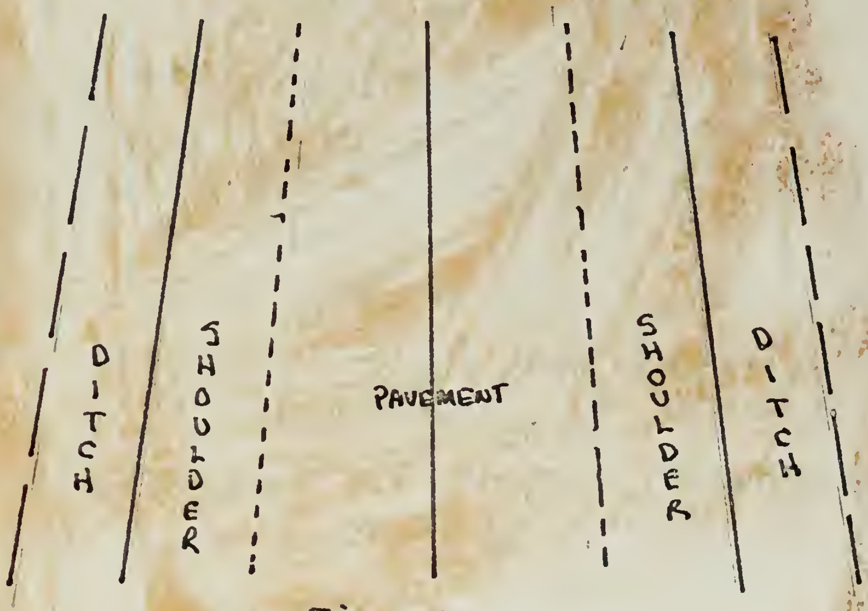

Figure 2

HIGHWAY DIAGRAM

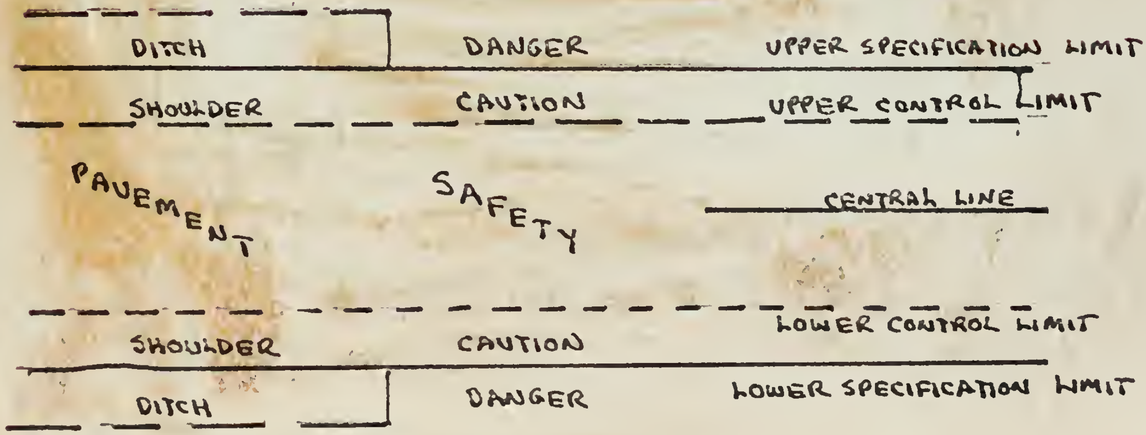

Figure 3: HIGHWAY LIKENED TO CONTROL

The control chart provided management with a tool ideally suited to the new theory of "management by exception." Only those products which show an exceptional deviation from the norm are investigated. Occasional, chance defectives are usually proven "freaks," but when the defectives repeat and develop a pattern, something is obviously wrong. It might be faulty machinery, faulty processing or methodology, or faulty personnel action. The control chart has flashed a warning of an area of possible trouble. Management must now follow this up and take corrective action.

> The growth beyond the level of merely pinpointing defects through statistical sampling methods without significant plans and long-range objectives, to a new position of vital force in management decision, is a solid indicator of the quality function's rising stature in today's industry.[1]

The key picture in this statement by James F. Bourquin of the Whirlpoor Corporation is "significant plans and long-range objectives . . ." So significant were the implications of control charts for decisions relating not only to mere control of quality but to personnel training, methods analysis, production control and so forth, that the quality function took on a completely new outlook.

> In the beginning (and still too frequently) the procedures of quality control by statistical methods were regarded as applying only to inspection problems. They were thought of as related only to the acceptance or rejection of material purchased by the plant. This, it is now recognized, is but a small portion of the area for fruitful applications.

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[1] James F. Bourquin, "Uses of Total Quality Control in Top Management Decision Making," Industrial Quality Control, (February, 1959), p. 15.

> The individual who writes the specifications should know the capabilities of the machines and personnel as well as the quality of the material. He needs to know the variations of the process so as to set tolerances in an intelligent manner and so that they can be held economically. Management needs to know when it is economical to make a fundamental change in the process. Will the present equipment produce satisfactory material? Is it more economical to recondition old machines or should money be spent for new ones? Is it more economical to employ trained personnel for a particular job or to use that which exists? Probable breaking points at which the various economies are affected are more readily obtained by statistical procedures than by certain empirical processes or hunches which one often has concerning them. In addition, a study should be made to determine if wages are just at various points in the production line,[1]

and so forth.

Total Quality Control became the aim of modern manufacturing firms. Says Armand F. Feigenbaum, President of the American Society for Statistical Quality Control, "Control (design plus material plus product plus process) divided by costs (inspection plus rejects) times customer satisfaction equal Total Quality Control."[2]

In identifying the role and position in the managerial hierarchy of the quality control man, Mr. Feigenbaum continues,

> The total quality view sees the prototype quality control man, not as an inspector, but as a quality control engineer--with an adequate background of the applicable product technology and with training in

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[1] Knowler, op. cit.

[2] Feigenbaum, op. cit., p. 93.

> statistical methods, in inspection techniques, and in other useful tools for improving and controlling product quality.[1]

James Bourquin of Whirlpool goes even further:

> Quality is a management function of equal stature with engineering, purchasing or manufacturing. The quality organization reports directly to top management at the same division staff level as a chief engineer, purchasing director or manufacturing manager. In both theory and practice, the quality control groups are independent of the production line organization and are free of pressure of meeting schedules. In other words, quality considerations are paramount and are placed ahead of sales schedules and short-term demands.[2]

For those who have operated under such pressures as production or sales schedules and short-term demands, Mr. Bourquin's views may be accepted with certain reservations. Managers in both government and industry are prone to skimp on inspection and quality when time is tight. Nevertheless, the progress made by quality control as a vital part of the management of a manufacturing business has been extraordinary.

"We should like to mention, however, that information processing systems can gain just as much from quality control principles as industrial operations."[3] And the application of

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[1] _Ibid_., p. 94.

[2] Bourquin, _op. cit_., p. 16.

[3] Morris H. Hansen, William N. Hurwitz and Leon Gilford, U. S. Bureau of the Census, _Science in Management_, ASQC 1959 Conference Proceedings, p. 149.

quality control techniques at a primary stock point in the Navy Supply System is primarily to a clerical operation, although both clerical and production-type functions are performed and could be subjected to this type of control. As has been said before, in order to achieve total quality assurance, all phases of the operation must be given equal attention. Particularly, all people involved in the operation must be subject to control. As William Travers Jerome III states,

> You don't control the quality of material; you control the engineers who set the specifications, the purchasing agent who buys, the lathe operator who processes it. You don't control operating costs or the capital costs of your machines; you control the people who decide what equipment to buy, how much maintenance is to be expended, what the load factors will be.[1]

And in a service operation like that performed by a Naval Supply Center, you control the clerks who massage the requisitions, the key-punch operators, the programmers who establish the data processing mechanics, the warehousemen who store and issue the material, the packers who package and address the orders, and the longshoremen who load them.

In searching for industrial firms who perform similar functions to those mentioned above, it was assumed that major mail-order houses such as Spiegels, Montgomery Ward and Sears, Roebuck must be faced with many of the same problems faced by a

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[1] William Travers Jerome III, "Executive Controls--What and Why," The Controller, (November, 1956), p. 511.

Supply Center, their operations being, generally, of a like nature. After all, "Quality Control means seeing to it that the customer gets what he believes he is buying. This entails whatever is necessary to accomplish such a mission."[1] Like the mission of a Supply Center, it is a mail order house's sole objective to satisfy the needs of its customers. Without accomplishing this, the Supply Center serves no purpose; the mail-order house is out of business.

The names Sears, Roebuck and Montgomery Ward have become synonymous throughout our fifty states with the mail-order business. Every major city or town is represented by either or both firms. They compete with each other for the mail order and retail markets. Their systems and philosophies have many similarities. There follow some comparisons of these philosophies.

In recent years, Sears, Roebuck has adopted a company policy of decentralization. The central offices are located in Chicago, as are Montgomery Ward's, but control has been delegated wherever possible to the District and Plant Managers. They operate practically independently of, but in competition with, each other--in terms of performance. Naturally, the product lines must be mutually agreed upon because the catalog is distributed world-wide and contains, basically, the same items for all districts.

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[1] Sigmund P. Zobel, "Quality Control from Front Door to Back Door," Industrial Quality Control, (December, 1960), p. 9.

But even in this area, districts have a certain amount of leeway in procuring items suited to their particular markets.

The Chicago office does not ignore district operations. Rather, a continual comparison is made and published of each district's performance from period to period. Centrally controlled auditors and inspectors oversee the operations of the various distribution plants. Among their duties is included a quality inspection of a sample of each day's production.

This inspection, which duplicates, in part, inspection performed by distribution center personnel, covers all phases of the processing of an order from the time it arrives at the plant until it is ready for shipment, but it is performed at the end of the cycle and is, strictly, after-the-fact. Its purpose is not to determine what personnel are making errors or to correct these errors. Rather, the idea is to determine an error rate to compare with other districts and to ascertain the quality of incoming material provided by suppliers. If suppliers are not providing quality material, it will be immediately brought to their attention, and continued poor performance will result in an end of the association.

The procedural inspection is designed, primarily, to verify the reports of the individual center's Department 180[1]

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[1] Department 180 at a Sears distribution center is the inspection department whose director reports to the production manager of that plant.

Inspection Reports. The responsibility for the quality of order processing within the center rests in the hands of the center's operations or production manager, not in the hands of an independent department as is the case at Montgomery Ward.

At this point it may be of some value to investigate some typical opinions about where the quality control function belongs in the management hierarchy. Henry H. Albers, in his book, Organized Executive Action, supports the theory that there is a difference of opinion in this area when he states,

> In some companies, the quality control executive reports directly to the executive vice-president or president, and in others this department is a subdivision of the production department.[1]

At Sears, it is the apparent feeling at the top management level that the production manager should be allowed to control his entire operation. W. W. Tatgenhorst, Special Assistant to the District Manager at Atlanta says

> We feel that our policies of employee participation in profits, and of fixing the responsibility for quantity and quality of production with the production people, generate the pride and interest that makes Sears a going concern.

On the other hand, Professor Raymond J. Ziegler, after conducting a study of sixty-three companies, large and small, in the Chicago-Milwaukee area, states,

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[1] Albers, op. cit., p. 89.

> Control applications are too often weakened, or worse, by being assigned to executives who are responsible for the activities they are asked to control. This questionable policy can lead only to subjective controls in most cases.[1]

Professor Ziegler's suspicions are well-founded. There can be no question that, in the world of business pressures, be they in government or in the outside economy, men have a tendency to be subjective in the reports they deliver into the hands of their superiors. If something is not going too well, it is rather natural to feel that this may be seen by top management as a reflection on the administrative ability of the supervisor in whose domain the trouble exists.

In an enlightened article on this subject, Morris Budin, Professor of Business Statistics and Economics, Syracuse University, said,

> The ability to manage well is functionally related to the quality and quantity of reporting information that passes over the executive's desk. With the growth of industry and government to their present magnitudes, managers are more and more dependent upon reports for the proper exercise of their control functions. Where, formerly, in small scale business organizations, managers were able to control activities by direct supervision of nearly all facets of business, today they are forced by the magnitude of the job to "manage by exception."
>
> It is very possible that review by "exception" may induce reporting agencies to avoid complete honesty in their reports, in the hope that by delay, minor, or even major, problem areas will be resolved within their own departments before the next report period comes around. . . . Report makers may believe, correctly or otherwise, that reports which indicate exceptional situations reflect on their capabilities as managers, so avoidance of such reporting may enhance promotion opportunities. Thus each contributes to reinforming the attitude of Mr. X who is unwilling to expose himself to his own detriment. . . .

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[1] Raymond J. Ziegler, "The Application of Managerial Controls in Selected Business Firms," Advanced Management, (August, 1958), p. 10.

Four types of dishonesty are prevalent:

White lies of commission are errors purposely introduced into a report. . . .

In falsification by omission, certain data are deliberately left out of a report. . . .

Bureaucracy is . . . the source of much falsification in reports . . . most difficult to contend with. . . .

Last are the white lies of circumvention. . . .

What are some of the ways in which management may adjust its behaviour to help reduce certain of the tendencies just described?

. . . The organization chart may indicate the allocation of duties but these may not be practicable because of the personalities involved or the latent pressures that are built up. A department may be charged with certain functions, but the responsibility for reporting on the quality of performance is given to another department. The organization chart may indicate that the latter has authority over the former, but factors not capable of representation on a chart have reversed this arrangement. Under such conditions the manager of the operating department will be tempted to hide adverse evidence, because the representatives of the reporting department lack the power to verify the details. Where the latter cannot develop the rapport to get clarification of problems and actions, reports are liable to be overgeneralized, filled with circumventions to avoid toe-treading. If the report is challenged we are apt to find the two departments disputing over the responsibility for the job, or the validity of the data, thereby shifting the focus away from the real problems under investigation, toward a conflict of personalities and authorities. Obviously, all these conditions are intensified if the management structure does not even try to define clearly the auditing powers of a reporting department.

A preferable avenue would be to have the reporting agency part of the operating department. For regular reporting the union of the two has the advantage of clearly defining the area of responsibility. It gives the department the responsibility for reporting problems and subsequently defending the details when audited. Sample audits in some limited area, or full audits would still be the function of some outside

> agency that is independent of the department and an arm of the executive staff, with enough authority to do its job fully.[1]

Sears has, apparently, adopted this "preferable avenue" in organizing its inspection system.

As will be noted in the Montgomery Ward policy, there are two schools of thought in this area. There is one interesting aspect of placing the responsibility for quality in the hands of the production executive. It was noted at the Sears Atlanta distribution center that quality inspectors were not in evidence in certain areas. When asked about this, Mr. Tatgenhorst, said,

> One of the advantages of having the quality inspectors under the operating division is that in peak periods these people can be used for productive work. . . . When some of our employees are on vacation we can transfer inspectors back onto the production line and not fall behind in our orders or production schedule.

James Bourquin's statements concerning quality control at Whirlpool were considered questionable. Experience indicates that a production supervisor, given a choice between performing a staff function--that of inspecting for quality of product and performance of personnel--and a line function--that of meeting a peak production schedule--will almost invariably lean toward the line activity. If Sears has achieved a balance and continues to perform both functions under pressure conditions (such as the Christmas rush) it appears a unique accomplishment.

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[1] Morris Budin, "A Problem in the Control Function of Management," Advanced Management, (January, 1958), pp. 14-17.

According to Sears' Department 180 Manual of Standard Inspections, revised in 1947 and still used as a basis for inspection policy, although decentralization has placed the development of techniques in the hands of individual center managers, these standard inspections have the purpose of "controlling quality and customer service standards." An example of the detail which is sought by the inspectors in arriving at this control is this excerpt from the Department 180 Manual:

> MERCHANDISE DEPARTMENT RECEIVING
>
> Check to be certain:
> That the receivers are observing the blind check system in receiving source shipments;
> That packing slips are not referred to until after a blind check has been made;
> That two separate checks by different persons are made where, because of space or other reasons, the merchandise is to be released for stock immediately; or where there is no invoice on file in Dept. 150 and the quantities received cannot, therefore, be checked against the invoice;
> That requests for rechecks by Dept. 150 do not disclose quantities or other information that would affect the accuracy of the rechecks. Rechecks and recounts are to be approved by the Department Manager or Assistant.
>
> . . . .
>
> Take a number of packing slips that agree with the invoices and make an actual count of the merchandise before it is released from the receiving room, to be certain that all of the merchandise listed on the packing slip was actually received. The purpose of this check is to determine that the receivers are not automatically accepting the quantities listed on the packing slips without making an actual count of the merchandise.
>
> Check to be certain that receiving from outside markings is confined to reliable sources only.
>
> Check for notation of damage or shortage by Dept. 176 in all cases where damage or in transit subject to transportation claim, is indicated. In the case of

concealed damage or shortage, be certain that Dept. 176 is notified promptly and notations are made. Be certain that transit shortages or damages are reported promptly to the transportation companies; also that prompt disposition is made of the damaged merchandise after inspection and/or release by the transportation company.

Check to be certain that improperly or incompletely marked shipments are reported by the receiving clerks by notations on the checking memos so that the irregularities can be taken up with the sources.

To the range of applications covered by the Department 180 Inspections, the following list, though far from complete, attests. Each is the title for a separate inspection:

Warehouse Items
Car Items
Telegraphed and Teletyped Orders
Letter Information
Piece Goods Orders
Form Stamps
Billing
Sales Listing
Cash Register Authentication
Correspondence
Catalog Requests
Returns and Adjustments
Factory Orders
Repair Parts Service
Substitutions
Reorders
Retail Requisitions
Purchases
Housekeeping

In each of the areas covered by the above list, inspections are made for quality of performance of product and by personnel. In all categories, standards, both general and specific, are set and performance compared with those standards.

"Controlling is a process or function of management for assuring that performance corresponds to plans."[1] Plans, however, cover the entire spectrum of management's projection for future operations. When discussing day to day activities, "the value of controls, assuming good planning and organization, depends on two things--the pressure of acceptable standards, and their use by competent executives for control purposes."[2]

Sears, Roebuck has set standards for both the quality and quantity of performance by their personnel. Each employee receives a grade in both categories which determines, in part, his potential for wage hikes, profit-sharing and promotion. The general feeling by Sears' managers is that quality and quantity go hand-in-glove. Both are controlled; attention to both is required in equal parts; customer satisfaction is the result only if the standards of both are adhered to in the highest degree.

Thus far the areas subjected to quality inspection at Sears have been discussed. The Montgomery Ward operation is practically identical to that performed at a Sears Distribution Center, some of the hardware being the only difference. However, the responsibility for product quality at Sears lies in the hands of the production executive. At Montgomery Ward this is not the case. The Inspection Service Department[3] reports directly to the

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[1] Ziegler, op. cit., p. 10.

[2] Ibid.

[3] Now, the Quality Control Department.

house manager and has equal status with the House Operations Department.

In the training of new employees at the Baltimore House, F. F. Farrell, former Inspection Manager, introduced the trainees to the organization and functions of the Inspection Service Department. The following are excerpts from the outline Mr. Farrell used in making this presentation:

> ### INTRODUCTION
>
> The purpose of our discussion today is to review the responsibilities of the Inspection Manager and the functions of the Service Inspection Department.
>
> It is the responsibility of the Inspection Manager and his personnel to administer the company's policy on quality control so that our customers will receive the best possible service. . . .
>
> ### RESPONSIBILITIES OF THE INSPECTION MANAGER
>
> 1. Reports directly to House Manager.
>
> . . . .
>
> 3. To bring to the attention of management evidence of unsatisfactory conditions affecting customer service to serve as a guide in appraising performance, determine the responsibility for unsatisfactory conditions, and indicating where corrective action is needed.
>
> . . . .
>
> 8. Responsible through his staff for:
> The inspection of a sufficient cross-section of completed orders to measure the day-by-day accuracy and completeness of the handling of all types of customer orders.
>
> . . . .
>
> 12. Follow up on employee productive methods and performance.
>
> ### SERVICE INSPECTION
>
> ### GENERAL RESPONSIBILITIES
>
> The Service Inspection Manager and his personnel will have an active part in the Quality Program. The Complete Order Inspectors will bring to the attention

[illegible]

[illegible]

[illegible]

> [illegible]

[illegible]

> 1. [illegible]
>
> ……
>
> 3. [illegible]
>
> ……
>
> [illegible]
>
> ……
>
> [illegible]

[illegible]

[illegible]

[illegible]

> of the Inspection Manager poor ship later and substitution handling, poor packing, defective or incomplete merchandise that would contribute to customers' returns. All Accuracy Control Checkers will be alert for any out of line conditions on order handling that would cause returns such as wrong fills, incorrect or illegible explanations stamps, or stickers, also, poor selections and other trouble desk mishandlings.
>
> These conditions will be brought to the attention of the Accuracy Control Supervisor so that the corrective action can be taken immediately. The Inspection Manager and his Accuracy Control Supervisor will cooperate with both the operating and merchandising organizations on all factors contributing to high returns. It will be their responsibility to initiate corrective action and review out of line conditions with the parties responsible.
>
> Regular monthly audits will be made by the Inspection Department to make certain correct procedure is being followed in the creating and handling of all Ship Laters and Substitutions.

Specific responsibilities of the Service Inspection function are included in Exhibit 3.

Thus far, Mr. Farrell's outline has concerned itself with completed orders. This inspection is that which takes place at the completion of the packing process as mentioned above. The object of this inspection is to prevent customer dissatisfaction and bring errors immediately to the attention of operating supervisors. Customer satisfaction is the primary goal.

The second phase of the Inspection Service Department's work is involved with Accuracy Control. Excerpts from the Inspection Manager's presentation on this subject are included as Exhibit 4.

Accuracy Control at Montgomery Ward is a plan for grading of individual employees. In a memorandum directed to supervisors at the Baltimore House on February 16, 1959, Mr. Farrell explained the accuracy control plan as follows:

> Accuracy Control is a plan established by management which is designed to measure activities that are highly repetitive in nature, such as: Mail Opening, Order Reading, Index Clerks, Entry Typists and Checkers, Pricers, Abstract Clerks, Order Checkers, Information Clerks, Completer-Packers, Sealers, Billers, and Tape Listers.
>
> Also where the time required to handle each unit of work is approximately the same and each employee's accuracy performance can be measured by checking a fixed number of units of completed work. . . .
>
> The Industrial Engineers, Service Inspection Manager, Department Managers, and Management Staff Members are directly responsible for the application of the Accuracy Control Plan.
>
> Industrial Engineers are responsible for determining and establishing activity accuracy objectives; accuracy rating scales; number of units to be checked each period and the length of the accumulation period.
>
> The Service Inspection Manager has the direct responsibility for the overall application of the plan. Accuracy control clerks report to the Service Inspection Manager to insure that the plan is followed in its entirety.
>
> The Department Manager is to review the accuracy performance for each individual employee and is to see that immediate corrective action is taken where required.
>
> It is also his responsibility, along with the supervisor, to review with the individual every mistake brought to his attention by the accuracy control clerk.
>
> Management Staff Members are to accept the findings of the accuracy control clerks and encourage, in every possible way, complete cooperation of all members of their organizations with the accuracy control organization. . . .
>
> Accuracy objectives are established by the Industrial Engineering Department for each activity by reviewing and analyzing past historical records which have been maintained and tabulated so that performance of individuals can be analyzed for days, weeks, check period and accumulation periods.

> The accuracy objective is a normal error rate based on the performance of experienced employees and earns a 3 rating.
>
> The number of units to be checked is to represent one hour's work each week with a minimum of not less than 70% of the specified number for the entire period of one month.
>
> The length of the accumulation period is to be of such length to assure that the finding of one error more or less than the number found in the previous period will not change the employee's rating by more than one degree. (From 3 to 3+ or 4 to 3+.) No period is set up in excess of 20 weeks. . . .
>
> Accuracy Control Clerks are furnished with a complete current listing of errors to be charged to employees on the activity on which they are being checked. . . .
>
> Each error detected against an individual who is on the accuracy control plan is recorded on the Monthly Check Record forms which are prepared for each activity and the actual error along with this form is turned over to the department head or supervisor by the accuracy control clerk. Department head or supervisor will in turn cover the error with the individual responsible and have the employee sign the Monthly Check Record form.
>
> No error is charged to an employee unless his signature or initial has been applied indicating that he or she is in agreement that an error has been made.
>
> At the end of each 4 week period errors and units checked are accumulated for this period and an error percentage entered on each individual record. These records are then forwarded to the department concerned and are then applied to the employee's Individual Performance Record. It is then the responsibility of the department manager to discuss accuracy problems with all individuals and to take corrective action and follow up on those employees whose rating is below expectancy. . . .

The system used by Sears, Roebuck is virtually the same. Can there be any question of the importance of quality in the management thinking and policy of these two major mail-order firms?

Summation

First, the development of quality control in manufacturing businesses has been traced from acceptance sampling to statistical quality control.

Next, examples have been shown of both Montgomery Ward and Sears, Roebuck's adaption of the inspection techniques to both production and clerical type work with the dual purpose of assuring customer satisfaction (Service Inspection) and close control over the performance of individual employees (Accuracy Control).

In the process it was demonstrated that there are two completely divergent schools of thought as to where the quality control function fits in the organization; Sears places it in the hands of the production executive, while Wards feels it should be on the same level as, and independent of, the production manager.

One area not covered, thus far, is the type of sampling employed by the two mail-order firms and its relationship to the statistical approach utilized by manufacturing businesses. There seems to be no statistical basis for the sampling conducted by either Sears or Wards. The sample size is roughly between five and ten percent of each employee's output. Randomness is not guaranteed. The inspectors pick items off the line as they pass by without reference to any rules for sampling. Yet it is on the

basis of this sampling that the employees' grades, and, in the case of Montgomery Ward employees, their salaries, are determined.

One interesting aspect of this lack of dependence on statistical bases and rigid formulae was revealed at the Sears Chicago Distribution Center. In the Order Clerical section, the Inspection Manager, Mr. Joe Stauber, was demonstrating what quality inspections were performed in this area. He exhibited a record maintained by the supervisor of that section which reported the results of a sampling taken of the thirty-to-fifty thousand orders handled daily. The error rate was practically nonexistent. However, close examination of the method for determining the rate revealed that the supervisor had been sampling about two to three hundred orders, had totaled the errors found and then had divided this by the total orders handled by the section. Here is an excellent argument for the function to be separate from the operating department.

The point, however, is that the validity of the results of these inspections cannot be proven since the samples are not random nor of a statistical nature. The mere presence of inspectors apparently produces the deterrent effect desired by Sears and Wards management--the deterrent to the making of errors. The program combines this deterrent with the incentive of better pay for better quality of performance. The net result, it is hoped, is customer satisfaction.

Chapter IV illustrates how the Navy can combine the certainty guaranteed by statistical quality control with the effectiveness achieved by Montgomery Ward and Sears, Roebuck to achieve the kind of satisfaction needed by fighting ships, aircraft and missiles.

> Antonio: Therefore, my merchandise makes me not sad.[1]

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[1] W. Shakespeare, The Merchant of Venice, Act V, Scene 1.

CHAPTER IV

A PROPOSAL FOR THE NAVY?

Portia. Happy in this, she is not yet so old
But she may learn; happier than this,
She is not bred so dull but she can learn.[1]

Chapter III demonstrated that the Montgomery Ward Accuracy Control Plan was designed to apply controls to personnel performing simple, repetitious jobs which have a direct or indirect effect on customer satisfaction. Chapter II provided an insight into what steps are being taken, at the present time, at Supply System Stock Points to improve service to customers. In the following pages a specific area at a major distribution point in the Navy's Supply System will be investigated where a simple, repetitious job is performed and to which statistical quality control techniques might be applied.

Despite some murmurings to the contrary, both Sears and Wards have established themselves as relatively reliable organizations when it comes to satisfying their customers. Why, then, should not the Navy Supply System adopt the techniques used

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[1] *Ibid.*, Act III, Scene 2.

by these firms rather than encumber itself with a more complicated device such as Statistical Quality Control?

In the first place, the technique employed by the mail order houses gives no guarantee of randomness. This being the case, there is no reason why the figures derived should be accepted as valid, and there is no more assurance that the sample of an individual employee's work is any more indicative of his performance than there is that the sample of the completed orders will point to the degree of defectiveness of the day's or week's production. As was pointed out in Chapter III, if controls are so loosely administered that clerical error percentages are being based on the number of errors found in a sample divided by the entire population, as was the case in Sears, how can there be any degree of assurance that similar mistakes are not being made throughout the system?

When Sears sends test orders to their various stores they can almost always show superiority over Wards. Wards, in turn, can display figures which "prove" their superiority over Sears. The point is not that the figures lie, but that they are neither objective nor scientifically valid. The Navy Supply System cannot afford subjective approximations of this nature.

In the second place, the Navy Supply System is rapidly converting to a Uniform Automatic Data Processing System, utilizing

the IBM 1401 Computer for its inventory control, receipt, issue and billing transactions. Insofar as the receipt, inspection, storage, recording of quantity, and location of stock, inventory up-dating, key punching, billing, and summarizing of invoices for material received are concerned, the use of a statistical sample is inherent to the system: the computer can produce it at any point.

If the Navy Supply System is to strive for perfection as its goal--the goal set by Admiral MacDonald--it cannot afford to utilize any but the most accurate of systems for assuring its customers that they are getting what they ordered when they want it. Statistical Quality Control will provide the tool needed to achieve the goal-- or at least, closely to approximate it.

The fact is that any process has a built-in variation about the mean. In the case of a manufactured item, this variation can be measured in fractions of inches from the setting of the cutting tool, and, as long as the measurement is within the tolerances or specification limits, the item is acceptable. But in a "lot" of items, there are going to be some measurements which exceed these limits. These are defectives, but as long as the percentage of these is within an Acceptable Quality Limit (AQL), to which the customer has agreed, the lot is accepted rather than subjected to 100% inspection and rejection of all defectives.

When the defectives are too numerous, the process is out of control, and something has to be done to correct the problem. Resetting the tool might be one possible solution.

In clerical work or in the storing, issuing, wrapping, marking, and addressing of packages, the errors cannot be measured in inches or fractions of inches. Rather, the job is right or wrong. In this case, the Quality Controller is interested not in variables but in attributes. Is the item the one ordered? Does it have the right stock number? Is the quantity correct? Is the address right? Has the right mode of shipment been selected to get the item to the customer on time? All these are either "go" or "no-go" situations. But even in these cases there are degrees of right or wrong, in a sense, because the essential consideration must be customer satisfaction. Consequently, if the item is not tagged with the right stock number, yet has the correct stock number on the invoice and is, in fact, the desired item, the customer should be able to put it to its correct use. But in cases of quantity and correct item, there is no gray area.

But even in work of this nature, there is, inevitably, a variation of performance by the individuals performing it. In explaining Statistical Quality Control, Sigmund Zobel states that SQC ". . . is the use of good statistical practice to help make the product so it conforms to its specifications, and to ensure that what gets shipped contains no more than a reasonable

proportion of defectives or number of defects."[1]

Determining what is a "reasonable proportion of defectives" and selling customers on its inevitability is a major problem in the Navy. Customers want no discrepancies. Statistics prove this to be practically impossible. Consequently, approaching perfection means that every possible step is being taken to reduce the proportion of defectives to a minimum. In order to achieve this it is the process or the people in it that must be tightened up. SQC will have the initial effect of reducing errors, but once an average is established, only a change in procedure can effect further reduction. SQC is to management what a speedometer is to a car: it tells you when you are exceeding the limit, but it takes some action by the driver through some other device to correct the problem.

As has been mentioned, sampling of product and performance is most effective in areas of repetitive, simple operations. Between the automation of the handling of storage and issue items (as well as paper work in some cases) and the adoption by the Navy Supply System of the UADP System, the jobs that are left for humans to perform fall into two categories: a few that are extremely complex in that they entail the handling of exceptions, and many,

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[1] Zobel, op. cit.

many which are simple and repetitious. In fact, it is their very simplicity and repetitiveness that make them highly susceptible to the committing of errors.

SQC can be applied, profitably, to almost any simple function performed by two or more people doing clerical work. In this context, the term "clerical" embraces any action which is involved with numbers, words or characters. In other words, if a laborer takes a card with a number on it, goes to a pile of parts and takes one out and compares its number with the number on the card, this is a clerical act. Thus, any matching, recording, checking, marking, addressing, adding, extending, counting--in fact, anything involving numbers--is considered clerical in nature. In the travels of a requisition from its source, the customer, to its final effectuation of delivery of the item at the same source, practically every step along its way is a target for statistical sampling methods.

In order to have items available to fill customers' demands there is another series of procedures which puts the items in the bins. This cycle, called the replenishment cycle, begins with a shortage of material which produces a procurement action. This action might be in the form of a requisition placed on another activity, a contract with a commercial firm to furnish the item, or an outright purchase. However the item is furnished, it is delivered by commercial or government vehicle to the stock

point, accompanied by a bill of lading and/or an invoice. The shipment is received, the quantity, stock number, markings, etc. checked, and the item starts toward its assigned location while the paperwork is converted into machine-readable form, and the data-massaging and document-producing begin. Here again are many areas where a statistical quality control approach might be employed.

The reason that attention is being focused on the receiving procedure is because it is through this process that items fail to end up in the same location, or in the same quantity, as is shown on the perpetual inventory records (if, in fact, there _is_ a record for the item). Whenever an error of this nature occurs, the item either cannot be issued at all, or it cannot be issued on time because someone has to search for it. Since the product of a Naval Supply Center is "Service to the Fleet," this type of error means a reduction in the quality of that product.

As Chapters II and III have illustrated, some effort has been made in both the Navy and industry to arrive at a system for ensuring quality through sampling and inspection techniques. In order to prove that a typical, simple, repetitious procedure is, in fact, defective and to test a system for controlling the procedure, a letter was sent to the Commanding Officers of the Naval Supply Centers at Norfolk, Oakland and Pearl Harbor requesting them to subject a specific area to a three weeks trial.

In part, the letter stated:

> The objective of the system is to provide a cheap, simple tool which can be used by management for the improvement of quality. It consists of sampling inspections at key check points with the purpose of letting management know immediately when errors are made and by whom.
>
> The enclosed instructions apply to a selected function, typical of the repetitive, clerical/materials-handling work performed in most areas of a Naval Supply Center. The results of the tests will provide comparative test cases which I hope will be of interest to managers plagued with complaints about quality of our service.

The area selected for the test was in the receiving operation. The following is a step-by-step outline of the actions required of the warehouseman in performing the storage function:

> 1. Receive material with Receipt Location Card from Receiving Operations.
> 2. Check card for the presence of primary, secondary, or tertiary location. If no location is indicated on card:
>   a. Check for space availability.
>   b. Assign a location into primary location block on the Receipt Location Card.
> 3. Check stock number on card against stock number of material received.
>
> . . . .
>
> Stock Numbers in Agreement:
>   a. Check quantity actually received against quantity on the receipt location card.
>   b. If quantities are equal and all material is in a Ready for Issue condition--
>   (1) Stow material in proper location.
>   (2) Sign and date Receipt Location Card and forward to Remote Operations (storage).[1]

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[1] Taken from the Uniform ADPS Support Procedures Handbook, Volume I, (Washington, D.C.: Bureau of Supplies and Accounts, NavSanda Publication No. 420), pp. IV A-5-A-6.

Figure 1 illustrates the Receipt Location Card. Figure 2 is a flow chart for the operation. In Figure 3, the warehouseman is storing the material; Figure 4 shows the Location Card being checked prior to the key-punch operation. Figure 5 illustrates the Location Card used in the storage and posting operation.

The following schedule was forwarded to the three commands for implementation of the system:

> Schedule: 9-10 March
>
> 1. Determine daily average of number of receipts from OSO.
>
> 2. Using MIL Standard 105D, Sampling for Attributes, DOD 1962, determine sample size to provide at least 95% confidence.
>
> 3. Set up procedure for taking a random sample of Receipt Location Cards (Oakland will have to use applicable document) so that storage personnel do not know before hand that sample is being taken.
>
> 4. Establish attributes on the basis of procedure outlined on pages IV A-5, 6, Uniform ADPS Support Procedures Handbook, Volume I, BUSANDA Pub. No. 420. The types of errors a warehouseman might make are indicated below:
>
> First, he might fail to check for the three locations. If he did this and stored the item in an area he "knew by heart," the location information in the computer might be erroneous (he just might have been right).
>
> Second, if he did check and found no location listed (or an erroneous one) he could err in writing in the number of the one in which he placed the material. This would very "accurately" place the wrong location in the computer.
>
> Third, if he fails to check the stock number he has already lost the material if it did not, in fact, match the number on the Location Card.
>
> Fourth, if he stows the material in the wrong bin or bay, he has lost it.

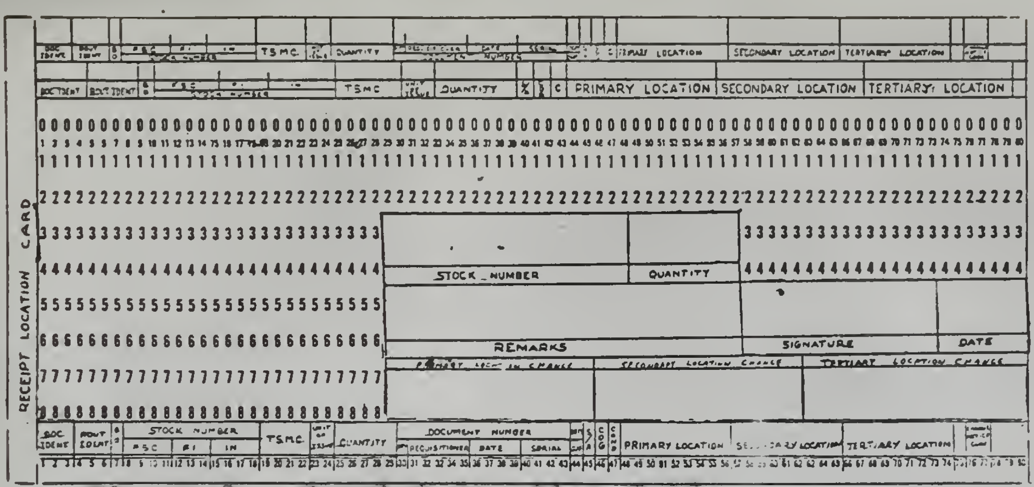
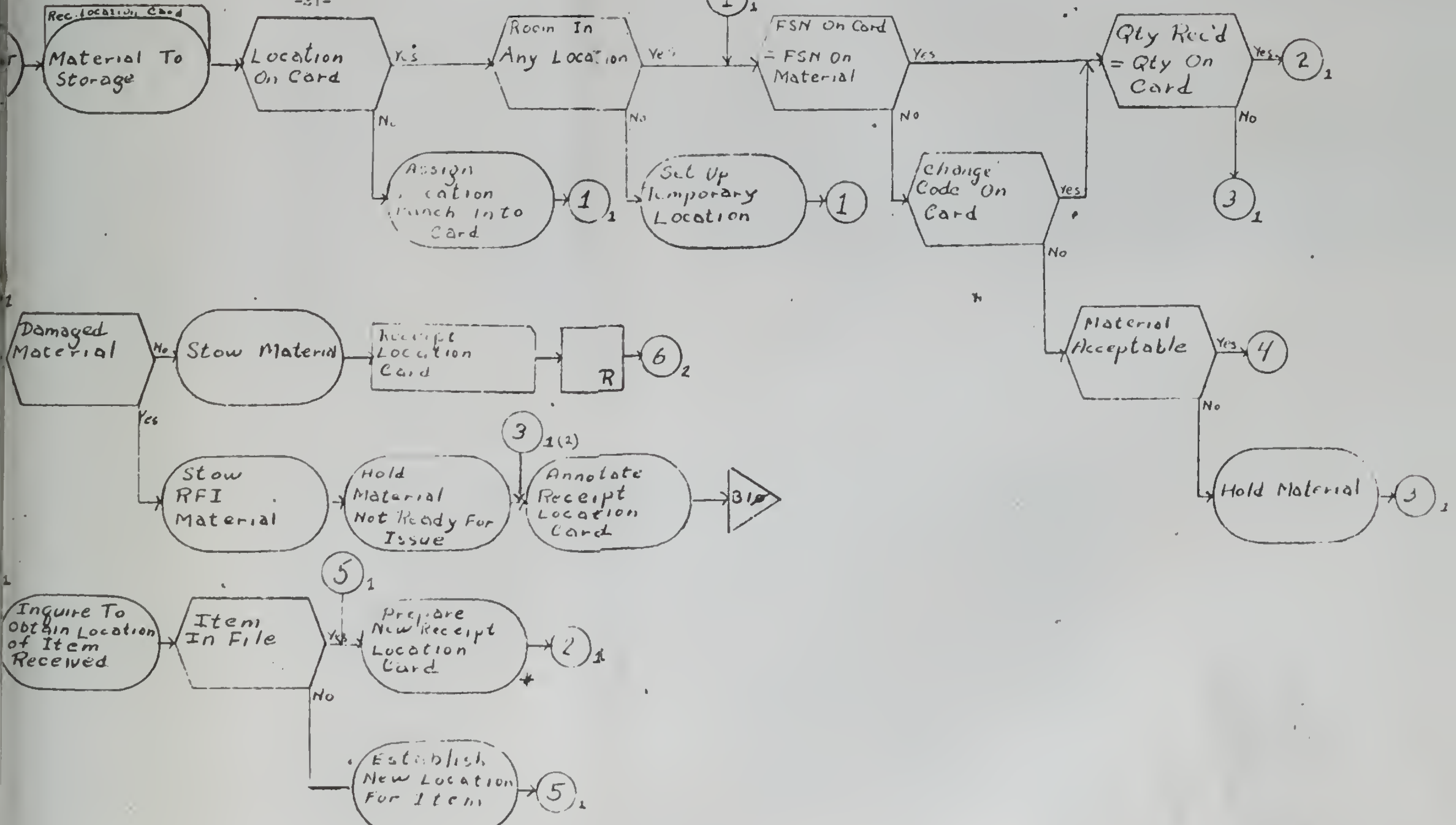


Figure 1. Receipt Location Card



* See Record Content Sheet B-12

ORM ADPS FOR STOCK POINTS

CATION B PAR I (REV 1)
ATION 4
STORED RECEIPTS

PAGE 1 OF 2

Figure 2. Flow Chart.

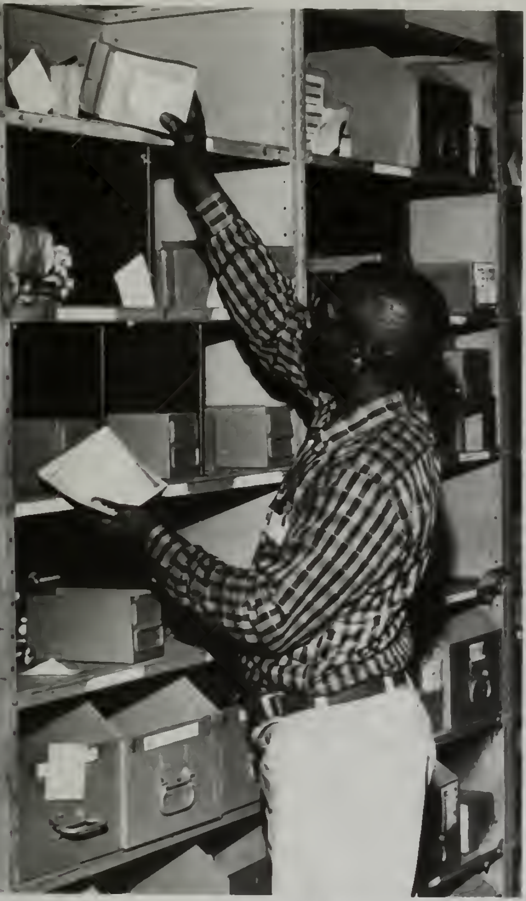


Figure 3. Warehouseman Storing Material

Figure 4. Checking of Location Card

Figure 5. Storage and Posting Operation--Location Card.

Fifth, if he doesn't count the items to be sure the tally agrees with the total on the Location Card, he may have committed a venial sin (usually, the quantity is not quite as significant since a certain margin of safety is built into the amount kept on hand. However, this depends to a great extent on the price of the article).

Sixth, if he fails to sign his name or puts in the wrong date, if nothing else, he has ruined any control system we might set up, but he has also prevented any follow-up by a supervisor or other interested party.

We have listed six mistakes that he could make. There are more, of course, but any one of the first four listed above might result in material becoming lost. If you wish to add any other types of errors, please do so, but let me know what they are.

5. Design and have duplicated Notification of Error Notices similar to the one attached.

11-12 March:

1. Assign one analyst to take the random sample of the Receipt Location Cards (take as lafge a one as you have personnel available to check location). If time is available, take two or three samples and use total defectives and total units sampled.

2. Check every card in the sample for the attributes listed above (plus what you have added).

3. Locations as well as stock records will have to be checked to find errors.

4. Determine percent defective for the function (divide number of items in sample(s) containing errors by the total number of items in the sample(s).

5. Construct charts for control and display.

$$\bar{P} = \frac{\text{Total number of defectives in sample(s)}}{\text{Total number of units inspected}}$$

$$\sigma_{\bar{p}} = \sqrt{\frac{\bar{p}(1-\bar{p})}{N}}$$

N = Number of units inspected (sample size)
UCLP = + 3 (Upper Control Limit)
UCLP = - 3 (Lower Control Limit)

13 March P.M.--With storage officer and material officer, or their representatives, conduct meeting of storage supervisors to explain the purpose of the test (training), and show them the charts that are to be posted in the work areas. Make certain they understand that (a) this is a test, (b) this is a tool for their use (in other words, no one is spying on them or "head hunting") and, (c) answer every question so that they will be able to pass the right word on to the people affected. Explain that the test will begin Monday.

16 March:--Sample work of 13 March, using a sample size large enough to give 90-95% confidence. Inspect locations and balance records, issuing error slips to supervisors of warehousemen concerned. Plot percent defective on all charts.

17 March-1 April:--Continue sample and charting. Keep running notes on reactions of personnel.

3 April:--Forward results, including copy of chart and all pertinent remarks.

The Naval Supply Center, Norfolk, Virginia did not conduct the test.

NSC, Oakland, California conducted the test under modified conditions. Since this activity is not yet under the Uniform Automatic Data Processing System, certain changes to the format were required. Figures 6, 7 and 8 illustrate the method of determining sample size, the types of errors considered (note how they differ from the ones specified in the test procedure) and the control chart utilized.

M. J. Horn, head of the Quality Assurance Section which conducted the test stated in his covering letter:

DETERMINATION OF SAMPLE SIZE

1. Average daily OSO receipts	1000
2. MILSTP 105D Sample for 1000 lot size	J
3. Sample size	80
4. Sample selection	

Each morning make a random selection of 80 documents from new receipts received in Receipt Control Division.

DETERMINATION OF CONTROL LIMITS

1. Previous sampling of receipt stowing errors had established a 1% error rate in major errors in receipt stowing.

$$\frac{(101)\ (199)}{80}$$

$$.0099 = \frac{.0995}{8.94} = .0111$$

UCL = .01 + 3 = .01 + .0333 = .0433

UCL = .01 - 3 = .01 - .0333 = .00

NAVAL SUPPLY CENTER
Oakland, California

Figure 6. Method of Determining Sample

MAJOR ERRORS

1. Failure to check for location.
2. Error in establishing new location.
3. Failure to check stock number.
4. Error in stowing material.
5. Erroneous count of material received.

MINOR ERRORS

1. No indication of initial receipt date.
2. Quantity received not circled.
3. No date and/or signature of receipt.
4. Misrouting of completed document.
5. Failure to prepare discrepancy report.
6. Leaving stow location notice attached to receipt document.

Major errors so classified because results in loss of material and erroneous quantity take-ups.

Minor errors so classified because of resulting delays in take-up or complete processing of documents.

NAVAL SUPPLY CENTER
Oakland, California

Figure 7. Classification of Errors

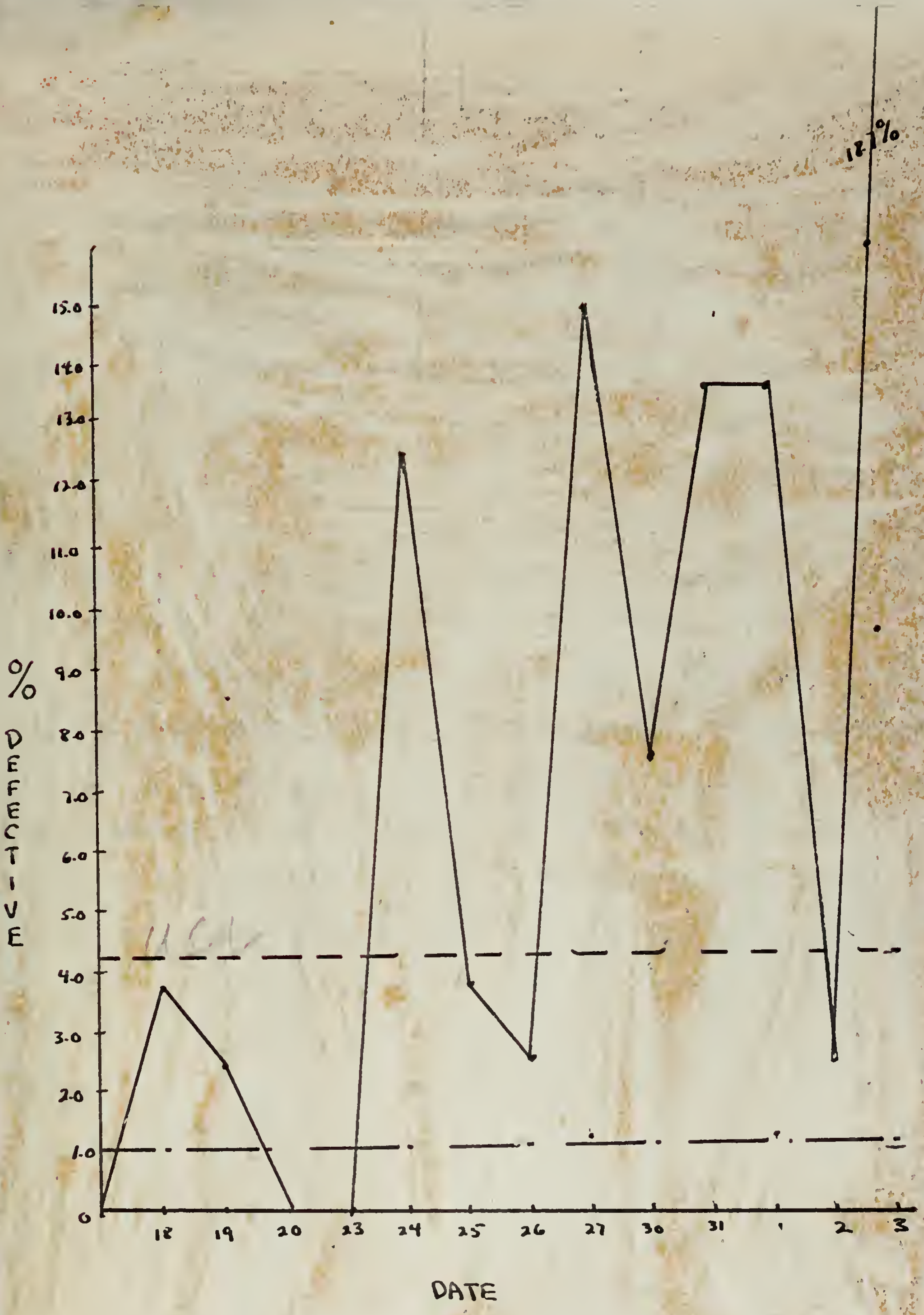


Figure 8. Control Chart

> The results of the test indicate a need for this method of control and indicate the applicability of the use of control charts. . . . The fact that work is being regularly inspected will provide benefits which are highly desirable in the management of the receiving process.

Mr. Horn indicated, further, that there were certain limitations to the use of MILSTD-105D in determining sample size. Of particular interest is the fact that Figure 6 shows that Oakland used 1% as the average error rate for major discrepancies. How this applies directly to receipts from other supply officers (at which the test was directed) is unknown.

Also, the seriousness of "minor" errors, as defined by Figure 7, in their effect on the immediate issue of material, cannot be determined. Failure to circle a quantity on a receiving document might result in the item not being taken up on the stock records. Misrouting of a completed document will cause a delay. It might result in the material never being taken up on the records. Other "minor" errors might also cause delay. Taking an average of the *total* discrepancies shown in Figure 3, gives a mean $\bar{p}$ of 7.4%. The upper control limit for a $\bar{p}$ of 7.4 is 9.8%. This indicates that on the 24th, 27th, and 31st of March, plus the 1st and 3rd of April, the process of receiving and storing of receipts from other supply officers was out of control.

The Naval Supply Center, Pearl Harbor, conducted the test as requested. Of 101 receipts sampled, 18 were defective--a $\bar{p}$ *for the whole period* of 17.8. This would place all samples

within the control limits, but, as Lieutenant T. S. Ott who conducted the test states: "These results indicate the need for such a management tool and the sampling will be continued at NSC, Pearl."

Figure 9 illustrates a breakdown of the types of errors made. Figure 10 is the control chart for the process.

The breakdown of the 22 errors found are as follows:

10	Material placed in location, one or two bins or shelves off from that recorded.
7	Material in previously recorded primary or secondary locations and new receipt placed in second primary or secondary location. When processed to computer old stock is lost.
2	No material found in any recorded location.
1	Bin not tagged with stock number.
1	Material sent to recorded location other than that indicated on receipt location card (not serious).
1	Wrong cog indicated on material (not serious).

NAVAL SUPPLY CENTER
Pearl Harbor, Hawaii

Figure 9. Types of Errors.

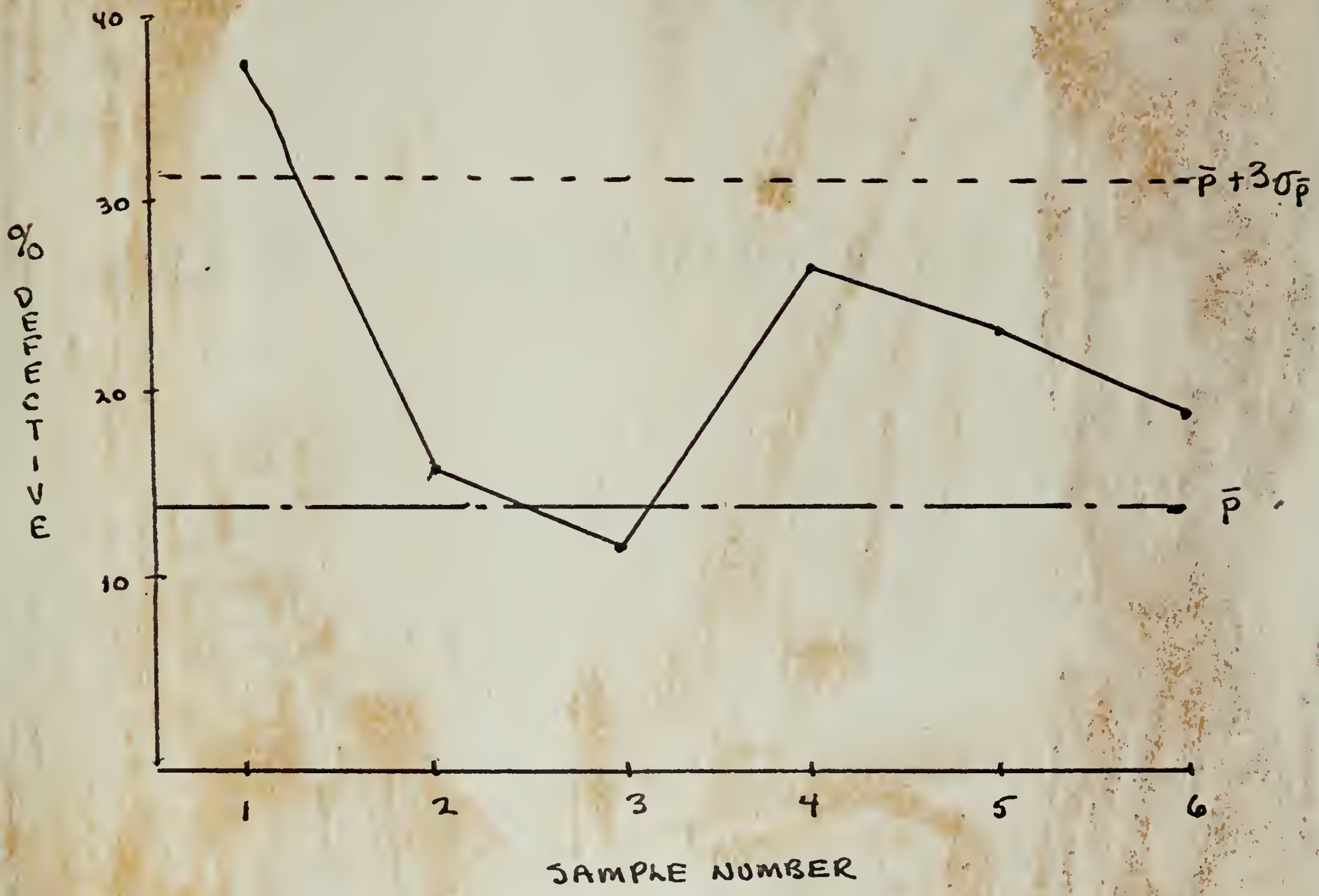


Figure 10. Control Chart

Management concedes, then, that the use of the control chart is a valuable tool which can point the way to improvement of methods and procedures (a 7.4 to 17.8 percent defective indicates looseness in the system) as well as to the tightening up of supervision over personnel.

> Portia: Lorenzo, I commit into your hands
> The husbandry and manage of my house.[1]

---

[1] W. Shakespeare, The Merchant of Venice, Act III, Scene 4.

CHAPTER V

SUMMARY AND CONCLUSIONS

Morocco: Pause there, Morocco,
And weigh thy value with an even hand.[1]

The term Quality Control is a relatively new one to both industry and government. The primary responsibility for quality of product has traditionally rested with the first line supervisor. With the expanded education of customers came the need for more than personal attention. The inordinate expense of 100% inspection by quality engineers forced management to seek cheaper methods. For manufacturing processes, statistical Quality Control was the answer.

The Department of Defense adopted the SQC principle in MIL-Q-9858 which requires quality control of its contractors and the application of quality control principles within the Department itself.

Reaction within the Navy Supply System to this requirement originated in an attempt to convert an antiquated physical inventory practice to an aggressive Quality Assurance Program which

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[1] _Ibid._, Act II, Scene 3.

would seek causes for errors and correct them. Although this first effort bore little fruit, the idea spread sufficiently so that the language of "statistical sampling," "randomness," "attributes," and "quality control" is now being used at the higher levels of stock point management. Effective preventive medicine has not yet developed.

Meanwhile, industry has realized the value of statistical quality control in manufacturing processes to the extent that the function occupies an extremely high place in the management hierarchy. To whom that position is responsible, however, is a matter of opinion. At the two major mail-order houses, which have functions comparable to a primary stock point in the Navy Supply System, the organizational thinking differs drastically. Sears, Roebuck places its quality inspection under the production manager. Montgomery Ward feels that this prevents objectivity and results in dilution of the quality control objective. At Ward's the Quality Control Department reports to the Distribution Manager.[1]

It is apparent from the detail to which these firms go in their inspection procedures that they put great emphasis on quality of product and service in their effect on customer satisfaction. This emphasis is illustrated both in the attention

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[1] Top of the management pyramid.

given to the order itself and to the application of standards of quality to personnel.

The effectiveness of their programs results more from the attention that the employee knows is being given to his work than to the method of determining what to inspect. Size of sample and randomness are not scientifically arrived at. Emphasis is, rather, on prevention of errors through inspection and monetary incentive.

Although these techniques might well be used to advantage by the Navy, the need for greater accuracy requires a more exact system. Statistics prove that some variance is inevitable, but the Navy must reduce the error rate and its variance to a minimum.

Statistical Quality Control is particularly applicable to the simple, clerical tasks which lead to errors and which are being multiplied by the new data processing systems. One such task is in the receiving and storing of material from other supply officers. Because it inserts the item initially into the stock point complex, this procedure provides the first opportunity for material to go astray, thereby affecting the ability to supply a need in the Fleet.

To examine this procedure, and the initial effects of a quality control application to it, a three week test was conducted at the Naval Supply Centers, Oakland and Pearl Harbor. The results

showed an error rate of from 7.4% to 17.8%. Both commands indicated they would continue with the procedure.

Conclusions

Both the increasing interest in Quality Assurance and the results of the aforementioned tests indicate that an excessive error rate does, in fact, exist in simple, clerical procedures performed at primary stock points of the Navy Supply System.

Presently employed efforts to reduce the error rate have not proven effective. The emphasis is on correcting errors after they have been made rather than eliminating the causes.

Industry has adopted two basic approaches: statistical quality control for manufacturing processes and sampling inspection of individual effort for retail applications. Adopting statistical methods to clerical functions has been talked about, applied in isolated cases, but has not caught on.

The Navy can adopt a statistical quality control approach for control over most of its clerical operations. In doing so, it will realize not only the benefits of immediate knowledge of weak areas but also can develop a system for measuring the quality of the performance of individual employees. (See Appendix B).

The function of quality assurance should be centralized in an organizational unit whose head reports directly to top management rather than to any operating department director.

> Portia: How many things by season season'd are
> To their right praise and true
> perfection![1]

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[1] W. Shakespeare, The Merchant of Venice, Act V, Scene 1.

EXHIBIT 1

ENCLOSURE (5) TO BUREAU OF SUPPLIES AND ACCOUNTS INSTRUCTION 4440 (PROPOSED)

1. The Bureau of Supplies and Accounts is developing a Quality Management Program premised on the principle that it is more effective to build quality into work by finding and eliminating the causes of errors than to achieve quality by screening work in order to simply make immediate corrections.

2. By definition, quality management is the development, implementation, and evaluation of techniques designed to measure, improve, and control the quality of work performed by individuals, groups, or organizations. It provides a systematic analytical approach to the attainment of optimum quality at minimum cost.

3. The various means currently employed for verifying and correcting balances on the stock record cards are after-the-fact corrective measures to correct errors after they have occurred. They do not provide a suitable means for locating and eliminating factors contributing to errors. It is considered to be of greatest importance to locate and eliminate the causes of errors

before they can contribute to stock record inaccuracies. Obviously, an effective preventative program will greatly reduce the need for verification and corrective operation.

4. The only systematic method now utilized for locating causes of errors is the audit and investigation of errors during the inventory process. The difficulty in researching and the doubtful nature of the conclusions which can be reached lead to the opinion that present audit and investigation methods are ineffective as a means to determining causes of errors. The large expenditures presently being made for this purpose are not justified by the results being obtained. A need exists for a continuous program of quality control to determine causes of errors detected. Reducing the ineffective, but manpower-consuming, audit and investigation functions should provide ample savings in personnel to provide sufficiently competent personnel to accomplish the analytical preventative tasks.

5. The Bureau of Supplies and Accounts will promulgate an acceptance sample plan to validate the accuracy of first count operations, employing acceptance-rejection levels. Under this plan, the tally cards turned in daily by each counter will be considered as separate lots. A random sample will be chosen from each lot for recount by an auditor. If the recount of the sample indicated an acceptable degree of accuracy, the entire lot will be accepted without the need for further recounts. Errors discovered

during the sampling will be corrected, but the balance of the lot will not be rechecked. If the sample indicates an unacceptable accuracy rate, only the tally cards for items sampled would be accepted. The balance of the lot will be returned for recount. Under this plan, supervisors can give prompt attention to cases where individuals are turning in a disproportionate number of inaccurate counts.

6. The continuing quality assurance program will include responsibility for analyzing all operations which can contribute to stock record errors. This continuing audit will include spot sampling of completed receipt and expenditure documents to ascertain the accuracy of processing at each step of the supply processing cycle. As an example, an expenditure document may be intercepted immediately after processing by the packing and preservation section. At this point, it should be determined whether the items and quantities agree with the expenditure document; have the proper documents accompanied the material; have the shipping containers been properly marked? Backtracking to the Control Department, have stock records been updated properly; have obligations been established when necessary; have proper documents been furnished to the Fiscal Department; has Issue Control Branch properly maintained a requisition file?

7. The countinuing audit also will include statistical sampling for accuracy of stock records and locator records on a continuing basis. This audit will include a random sample of locator cards to be checked against individual stock locations, to verify the accuracy of the locator file; and a random sample of the stock in individual storage locations to be checked against the locator file. A random sample of stock record balances will be selected for verification of the on-hand balance by determining applicable locations from the locator file, counting the quantity in each location, computing the total quantity on hand and comparing it to the stock balance card quantity. (Due regard will be taken of pending transactions at the time of sampling.)

8. The results of the samplings will be reflected graphically by an organizational component or function so that they portray the quality of an activity's day-to-day operation. This portrayal will identify areas requiring management attention and will do it in time to prevent deterioration of inventory records. This program is aimed at maintaining an acceptable level of accuracy on a continuing basis so that, at all times, we know what we have and where it is.

EXHIBIT 2

AREAS INVESTIGATED BY NSC, NORFOLK'S Q. A. D. PROGRAM

QAD[1] Project #1--statistical sampling of inventory. Results were as expected; material was in such poor shape, wall-to-wall inventory was required. Suggested alternative plan of inventorying only fast-moving items. BuSandA Speedletter 4440 of 25 October 1963, in effect, concurred with this.

QAD Project #2--analysis of detail cards offset. This was an examination of a clerical, manual-mechanized procedure which resulted in producing an error rate and a break-down of types of errors: not pinned down to any individual.

QAD Project #3--statistical analysis of locator banks in the material department. Again, results showed error rate and type error.

QAD Project #4--another analysis of a clerical operation involving unmatched financial inventory control cards. Results: error rate and type error.

QAD Project #5--Under NSCNORVA Instruction 4440.38 of 1 June 1962, the inspection of purchased material had been placed

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[1] Quality Assurance Division.

under a quality assurance program. By 21 November 1962, this program had migrated under the control of the Quality Assurance Division. Again, results were in terms of types of error and error rates.

QAD Project #6--was a special inventory of the Center's DESMART[1] operation.

QAD Project #7--was another sample type inventory showing discrepancies, gains, losses and types of errors committed.

QAD Project #8--is a running project on the inventory of items with zero balances, etc., as called for by the current inventory directive.

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[1] A retail, supermarket set-up for the use of customers with small order.

EXHIBIT 3

INSPECTION SERVICE DEPARTMENT

Definite Responsibilities

1. In the inspection of completed orders, Inspectors should be on the alert for poor substitutions, poor packing, and defective merchandise. Substitutions should be explained to customers. Every substitution will be recorded by the Order Inspectors and this listing will be delivered to the Merchandise Manager's office by 12:00 noon each day for his review. All questionable substitutions will be immediately referred to the Inspection Manager. When it is agreed the substitution is unsatisfactory, the disposition will be pulled and substitution stopped at once. They should be on the alert and report conditions causing returns due to operating errors, damage, defective, not as catalogued, etc. Copies of customer's letters should be sent to the department concerned to make an investigation and a follow up should be maintained to see that action is taken.

2. All Accuracy Control Personnel should be instructed to question all substitutions and all items filled with an

explanation sticker attached to the merchandise or an explanation applied to the order.

3. The Service Inspection Manager should review examples of complaints and returns at the Bi-Weekly Service Inspection Meeting. He should also review examples of poor substitutions and poor ship later handling which may occur.

4. The Service Inspection Manager in cooperation with the Merchandise Operating Organization should participate in the Merchandise Review Meeting, in all divisions on all new items listed. Comparisons should be made with samples of actual stock and samples of merchandise received.

5. The Inspection Manager will include in his regular Monthly Departmental Audits a complete review of all ship later handling. This audit will cover the proper authorization, accuracy of filing, handling of look-ups, the pulling of ship laters when merchandise is received, overdue ship laters in the department and correct authorization and handling of omissions, substitutions and extensions on ship laters that cannot be filled on the due date.

6. A daily analysis is made on all ship adjustments. These facts are recorded divisionally and are submitted weekly to the House Manager. Any out of line condition is brought to the attention of the staff member and department head responsible.

Service Inspection

1. Purpose of Inspection Program

a. To measure day by day accuracy of the handling of all customers transactions.

b. Investigation of conditions not directly covered by Inspection of Completed Orders and Adjustments, but which indirectly affect customer service. Example: Ship Laters, Substitutions, etc.

2. Types of Finished Work Inspected

a. Completed orders (Direct Mail, Catalog Unit Will Calls, and Metro Phone Orders).

b. Time Service and quality Service to Catalog Sales Department.

3. How Mistakes Are Charged

a. Mistakes found in the Inspection of Completed Orders will be charged to one of the following classifications:

(1) Wrong Fills.

(2) Failure to handle Special Requests.

(3) Over and Under Refunds.

(4) Soiled, Damaged, or Defective Merchandise.

(5) Failure to allow proper credit.

(6) Failure to deduct due bill.

b. Mistakes not affecting customers which are those where existing instructions have not been followed, or the error is of less serious nature:

(1) Careless application of labels.

(2) Waste of supplies.

(3) Insufficient labels.

(4) Failure to sign form letters.

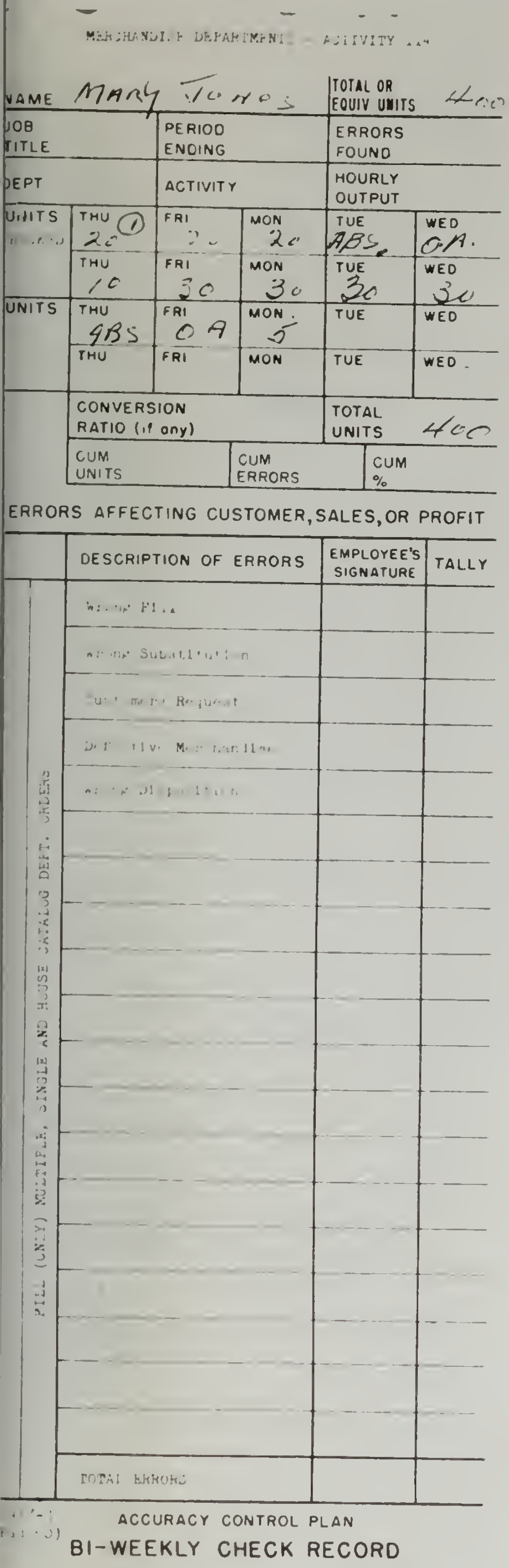
4. Forms Used on Service Inspection

a. Correction Memo (23568-3)

b. Analysis of Service Inspection Error (LB440)

c. Daily Report of Mistakes (23570-16)

Exhibits for all forms attached



MERCHANDISE DEPARTMENT – ACTIVITY ...

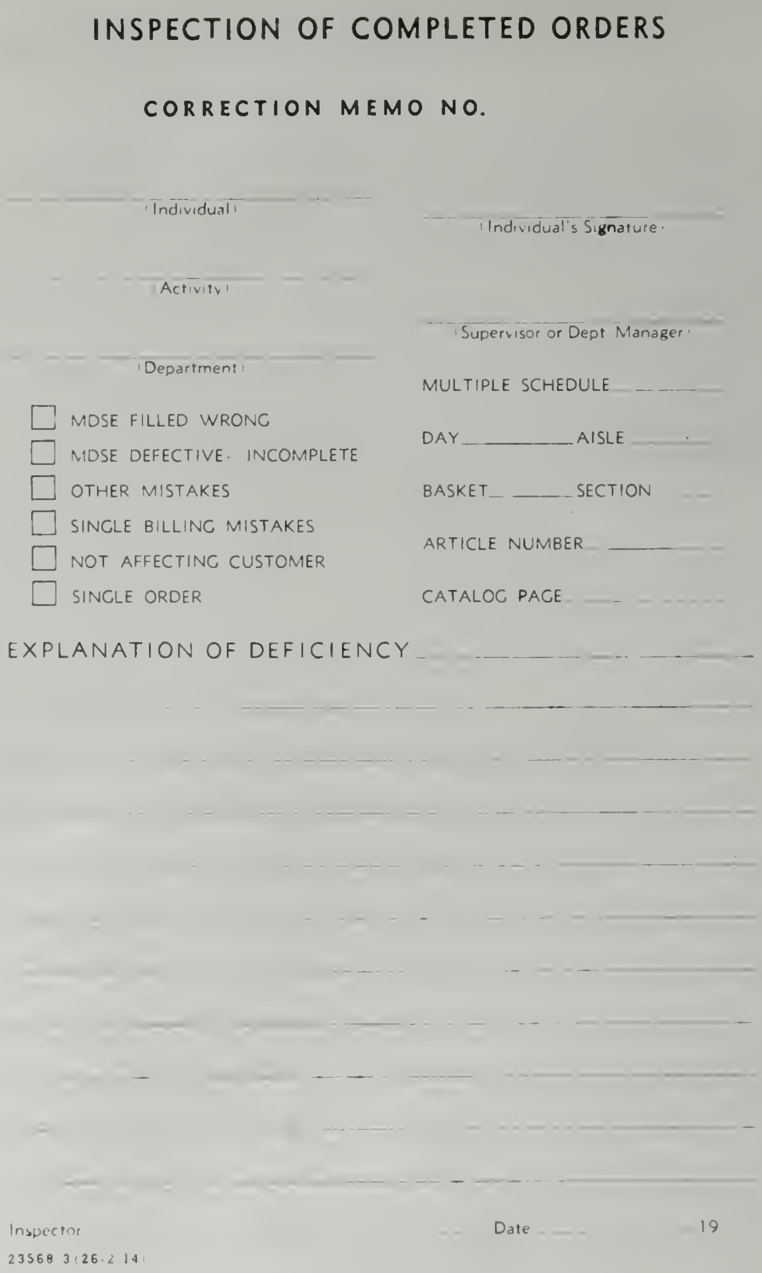
NAME Mary Jones			TOTAL OR EQUIV UNITS	400
JOB TITLE	PERIOD ENDING		ERRORS FOUND	
DEPT	ACTIVITY		HOURLY OUTPUT	
UNITS	THU ① 20	FRI 20	MON 20	TUE ABS.	WED O.A.
	THU 10	FRI 30	MON 30	TUE 30	WED 30
UNITS	THU ABS	FRI OA	MON 5	TUE	WED
	THU	FRI	MON	TUE	WED
	CONVERSION RATIO (if any)		TOTAL UNITS 400	
	CUM UNITS	CUM ERRORS	CUM %	

ERRORS AFFECTING CUSTOMER, SALES, OR PROFIT

	DESCRIPTION OF ERRORS	EMPLOYEE'S SIGNATURE	TALLY
FILL (ONLY) MULTIPLE, SINGLE AND HOUSE CATALOG DEPT. ORDERS	Wrong Fill		
	Wrong Substitution		
	Customer's Request		
	Defective Merchandise		
	Wrong Disposition		
	TOTAL ERRORS		

ACCURACY CONTROL PLAN

BI-WEEKLY CHECK RECORD



INSPECTION OF COMPLETED ORDERS

CORRECTION MEMO NO.

(Individual)

(Individual's Signature)

(Activity)

(Supervisor or Dept Manager)

(Department)

MULTIPLE SCHEDULE

☐ MDSE FILLED WRONG

☐ MDSE DEFECTIVE - INCOMPLETE

☐ OTHER MISTAKES

☐ SINGLE BILLING MISTAKES

☐ NOT AFFECTING CUSTOMER

☐ SINGLE ORDER

DAY ____ AISLE ____

BASKET ____ SECTION ____

ARTICLE NUMBER ____

CATALOG PAGE ____

EXPLANATION OF DEFICIENCY ____

Inspector ____ Date ____ 19

23568 3(26-2 14)

ANALYSIS OF SERVICE INSPECTION ERROR

Department____________________ Activity________________ Date________

1. Description of Error____

2. Performance History of Employee Making Error:

a) Personal Data

Name____________________ Job Title____________________

Date on Present Job__________ Date Hired__________ Rating for Which Paid_____

Current Appraisal Rating (a) Accuracy__________ (b) Output______

(c) Dependability________ (d) Overall_____

b) What action has been taken on above factors rated unsatisfactory?

c) If on training, what does training records show as to progress on accuracy and output?

d) What is name of instructor who taught this employee the work?__________

3. What caused the error?____

4. What corrective action will be taken?______________________________

LB 440

Signed____________________
(Department Head)

DAILY REPORT OF ORDER [illegible]

House [illegible] 19

COMPLETED ORDER INSPECTION [illegible]

	[illegible]		DEFECTIVE INCOMPLETE		FACTORY FROM ERRORS		[illegible]			
	CUM.	CUR.	CUM.	CUR.	CUM.	CUR.	CUM.	CUR.		
TOT.										

	OTHER DEPARTMENT [illegible] and TOTAL HOUSE	[illegible]		PERCENT	
		CUM.	CUR.	CUM.	CUR.
	[illegible] Opening				
	Order Reading				
	Index				
	Entry				
	Pricing				
	Freight and Express Clerical				
	Factory Order Clerical				
	TOTAL ORDER CLERICAL				
	TOTAL SINGLE BILLING				
	TOTAL MULTIPLE BILLING				
	TOTAL PACKING				
	TOTAL PACKING AND BILLING				
	TOTAL OPERATING DEPT.				
	TOTAL MDSE. DEPT.				
	Metro Clerical				
	Metro Packing				
	Metro Billing				
	TOTAL METRO				
	TOTAL HOUSE Errors				
	TOTAL HOUSE Customer's				

[illegible] INFORMATION

Period Last Year % Season Objective %

	[illegible]		ERRORS			
			NUMBER		%	
	CUM.	CUR.	CUM.	CUR.	CUM.	CUR.
Direct Mail						
Will Call						
Parcel Delivery						
TOTAL						
Total [illegible]						

SEASON TO DATE

EXHIBIT 4

ACCURACY CONTROL

1. Description of Duties of Accuracy Control Clerk.

Under general supervision, examines a prescribed amount of completed orders and merchandise handling work for each of an assigned group of employees to determine whether the work has been completely and accurately handled. Obtains acknowledgment of errors or irregularities by the employee responsible.

Prepares and maintains records that are part of the Accuracy Control Plan. Performs related duties as required.

2. Typical Examples of Work.

Selects a specified number of units of work to be checked each of an assigned group of employees in a department under an accuracy control plan and examines the work thoroughly for errors or irregularities.

Discusses errors or out of line conditions with the supervisor responsible and reviews the correct methods or procedure to be followed, may create error vouchers and have employee sign voucher to acknowledge errors and correction, may return errors to employee responsible through supervisors.

Tabulates daily the total number of units audited for each employee and the errors found, prepares weekly report for each employee showing total units checked, number and type of errors found and percentage of errors to number of units handled, and prepares monthly summary for department showing number of employees checked, number and type of errors found and the percentage of errors to number of units handled in the department.

3. Accuracy Control Errors.

Each Accuracy Control error must be reviewed by the Department Head, or Supervisor, with the individual responsible and determine if the individual is properly trained. Also cover the error in question with employees on the same activity. At the close of each monthly period the Supervisor must review the Accuracy Control results with each employee who failed to meet their objective and enter in the Individual Performance Record a transcript of the interview.

4. Unsatisfactory Employees.

Each Monthly Period, the supervisor will have reviewed with each employee who failed to make their accuracy objective and entered in the Individual Performance Record a transcript of their interview. The Department Head must review these Individual Performance Records with the Supervisor and determine if the employee has been properly supervised or simply not qualified to

handle the job, and act accordingly.

Forms used on Accuracy Control attached.

ACCURACY CONTROL PLAN

INDIVIDUAL QUALITY CHECK RECORD

NAME

ACTIVITY

WEEK ENDING

DEPARTMENT

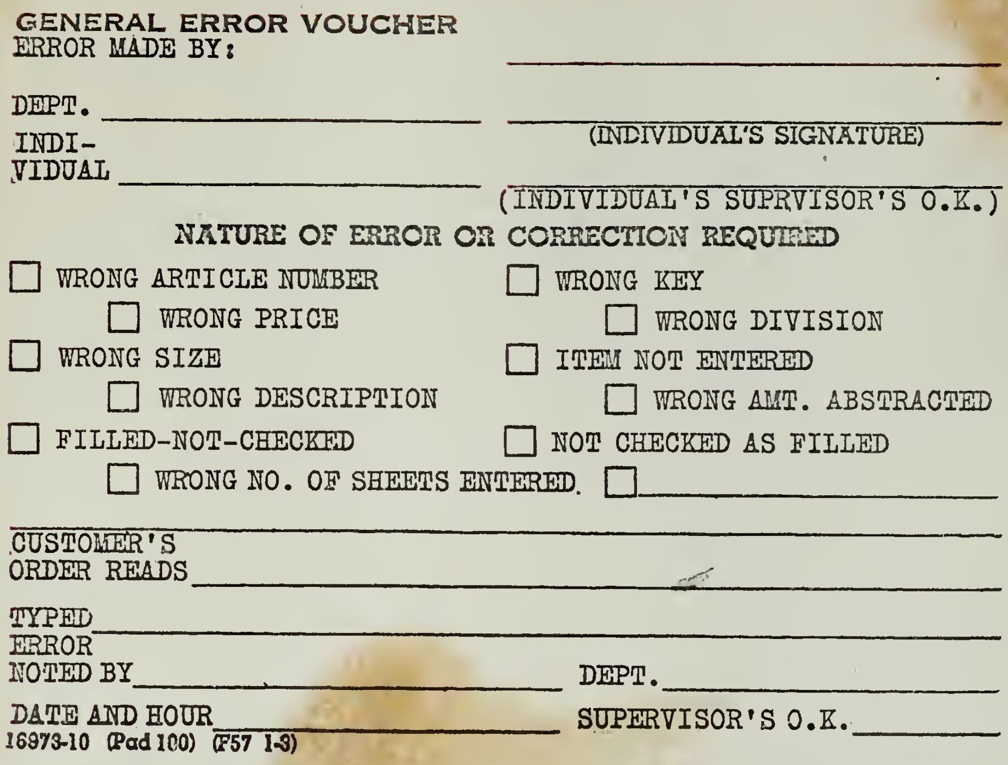
UNITS CHECKED

THURS.	FRI.	MON.	TUES.	WED.	THURS.	FRI.	MON.	TUES.	WED.
THURS.	FRI.	MON.	TUES.	WED.	THURS.	FRI.	MON.	TUES.	WED.

ERRORS AFFECTING CUSTOMER, EXPENSE OR SERVICE

EMPLOYEE'S INITIAL

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.



GENERAL ERROR VOUCHER

ERROR MADE BY: ____________________

DEPT. ____________________

(INDIVIDUAL'S SIGNATURE)

INDIVIDUAL ____________________

(INDIVIDUAL'S SUPRVISOR'S O.K.)

NATURE OF ERROR OR CORRECTION REQUIRED

☐ WRONG ARTICLE NUMBER
☐ WRONG PRICE
☐ WRONG SIZE
☐ WRONG DESCRIPTION
☐ FILLED-NOT-CHECKED
☐ WRONG NO. OF SHEETS ENTERED.
☐ WRONG KEY
☐ WRONG DIVISION
☐ ITEM NOT ENTERED
☐ WRONG AMT. ABSTRACTED
☐ NOT CHECKED AS FILLED
☐ ____________________

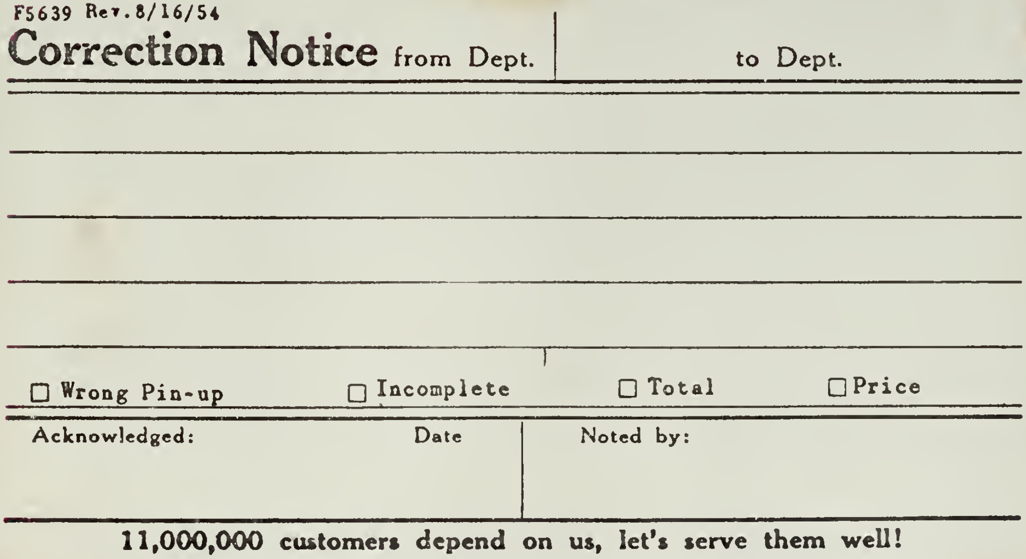
CUSTOMER'S ORDER READS ____________________

TYPED ERROR ____________________

NOTED BY ____________________ DEPT. ____________________

DATE AND HOUR ____________________ SUPERVISOR'S O.K. ____________________

16973-10 (Pad 100) (F57 1-3)



F5639 Rev. 8/16/54

Correction Notice from Dept. to Dept.

☐ Wrong Pin-up ☐ Incomplete ☐ Total ☐ Price

Acknowledged: Date Noted by:

11,000,000 customers depend on us, let's serve them well!

ACCURACY CONTROL - ERROR VOUCHER

UNIT ____________________ DEPARTMENT ____________________

☐ STOCK ORDER ☐ WILL CALL ☐ METRO ☐ DIRECT SHIP

MERCHANDISE FILLED WRONG

NUMBER OF PIECES ORDERED ☐

NUMBER OF PIECES FILLED WRONG ☐

ORDERED ____________________

____

FILLED ____________________

____

☐ ILLEGIBLE ADDRESS ☐ INCORRECT OR NO ADDRESS ON LABEL ☐ INCORRECT OR NO STOCK ORDER NO. ON LABEL

☐ INCORRECT OR NO WEIGHT ON STOCK ORDER ☐ TOTAL QUANTITY & QUANTITY FILLED DO NOT AGREE

☐ INCORRECT OR NO UNIT, DEPT., ARTICLE #, QUANTITY, DESCRIPTION, OR WEIGHT ON LABEL

☐ POOR PACK ☐ DAMAGED ☐ WRONG CLASSIFICATION

DETAIL ____________________

____

☐ LABEL PULLING

☐ WRONG SKIRT & LABEL ☐ WRONG LABEL ONLY ☐ WRONG SKIRT ONLY

DETAIL ____________________

____

INSPECTOR ____________________ DATE ____________________

Dept. ____________

ACCURACY CONTROL ERRORS

Date ____________

			RESPONSIBILITY	
NAME	ACTIVITY	DESCRIPTION OF ERROR	INDIVIDUAL	SUPERVISOR

____

ACCURACY CONTROL CHECKER

[illegible]

○ [illegible]

○ [illegible]

○ [illegible]

[illegible]

INDIVIDUAL EMPLOYEE PERFORMANCE RECORD

Effective Date	JOB TITLE	Wage Rate	Next Appr. Date

(Employee's Addressograph Plate)

MAKE BRIEF APPROPRIATE COMMENTS AS REQUIRED ON ALL FACTORS IN SPACES PROVIDED BELOW OR ON REVERSE SIDE.

YEAR:		(______) (Weeks Moving Avg.) ACCURACY*			OUTPUT			Cooperation—Dependability—Attendance and Punctuality		List in first rating space, in order of importance, other jobs employee can do well; enter additions in months in which learned.		Total Rating
	1961	UNITS	ERRORS	%								
Week End	Hours Worked	Per. / Acc.	Per. / Acc.	R	Hours on Output	Hourly Output	Rating		Late / Abs.		Rating	
JAN. 4												
11												
								Rating______				
FEB. 1												
8												
15												
22								Rating______				
MARCH												
22												
29								Rating______				
APRIL 5												
								Rating______				
								Rating______				
								Rating				

cc: Messrs: R. M. Elliott - Chicago
E. R. Pearce
W. J. Duffy
Asst. Merchandise Manager
Merchandise Supervisors

Baltimore, April 5, 1951

Mr. E. J. Garrity

Service [illegible] Summary

The following is a summary of the eleven (11) order handling mistakes in our check of 800 orders for the month ending April 5, 1951.

Merchandise Departments Wrong Fills		(10)	1.25%
1. 16A1178	DM	Order Checker	Ordered #1178, filled #1187 (House Handling)
2. 18A9042	WC	Order Checker	Ordered 4, filled 5 (House Handling)
3. 20A6167	DM	Order Checker	Ordered #6167, filled #6171 (House Handling)
4. 24A1842	DM	Order Checker	Ordered size 8 1/2, filled size 8 (House Handling)
5. 33A1041	DM	Preparation Check	Ordered size 16, size 14 prepared as size 16 (Source Preparation)
6. 53A4167	FO	Preparation Check	Ordered #4167, prepared #4168 as this item (House Handling)
7. 61EM1587	DM	Order Checker	Ordered size 32B, filled size 34B (House Handling)
8. 62A7641	WC	Order Checker	Ordered #7641, filled #7640 (House Handling)
9. 67H4110	DM	Order Checker	Ordered size 5 X 7, filled size 8 X 10 (House Handling)
10. 84A430	WC	Order Checker	Ordered size 1 1/2 X 8, filled 1 X 8 (House Handling)
Defective - Incomplete		(1)	.13%
1. 35M4419	WC	Preparation Check	Defective merchandise. Small hole and flaw in pajamas (Source Preparation)
TOTAL MERCHANDISE DEPARTMENTS		(11)	1.38% Objective 1.25%

Operating Departments					
Index			(1)	.23%	Objective .10%
1.	DM	Indexer		Failed to apply Box 234 on label	
Pricing			(2)	.26%	Objective .30%
1. 81A4947	PO	Pricer		Failed to change price to agree with catalog price $3.30 should be $2.30	
2. 24A9173	DM	Pricer		Failed to change article number to agree with color	
Multiple Billing			(1)	.34%	Objective .36%
1.	DM	Biller		Incorrect charge for merchandise $26.02 should be $23.01	
TOTAL OPERATING DEPARTMENT			(4)	.50%	Objective .75%
TOTAL HOUSE			(15)	1.80%	Objective 2.00%
TOTAL CUSTOMER AFFECTED			(15)	1.86%	Objective 2.00%

MAIL ORDER SUMMARY OF

TYPE OF ORDER HANDLING MISTAKES AND MERCHANDISE IRREGULARITIES

MONTH ENDED 4-5-61

CUM. FROM 2-1-61

HOUSE	ORDER HANDLING IRREGULARITIES						MERCHANDISE IRREGULARITIES				OPERATING MANAGER'S DEPARTMENT							
	PERFORMANCE RANKING ORDER HANDLING		% ORDERS FOUND WITH ORDER HANDLING MISTAKES DIRECTLY AFFTG. CUSTS. (HOUSE TOTAL)		NO. OF COMPLETED ORDERS INSPECTED		% SHIPLATERS (TO LINE ITEMS)		% SUBSTITUTIONS (TO LINE ITEMS)		MAIL OPENING AND OTHER READING MISTAKES		INDEX DEPARTMENT MISTAKES		ENTRY DEPARTMENT MISTAKES		PRICING MISTAKES	
	MONTH	CUM.	MONTH	CUM.	MONTH	CUM.	MONTH	CUM.	MONTH	CUM.	MONTH	CUM.	MONTH	CUM.	MONTH	CUM.	MONTH	CUM.
CHICAGO	IT	8	1.61	2.43	1983	3233	.52	.51	2.03	1.76	.07	.04	.11	.06	-	.13	.25	.37
ST. PAUL	8	7	2.38	2.33	800	1800	1.38	.98	.99	.98	-	-	.23	.10	.61	.81	.13	.33
KANS. CITY	IT	IT	1.88	1.56	800	1800	1.45	1.01	2.18	2.32	.16	.07	.23	.10	1.22	.54	-	.17
BALTIMORE	IT	IT	1.88	1.61	800	1800	1.72	1.44	1.83	1.66	-	-	.23	.20	-	-	.26	.23
ALBANY	IT	IT	1.00	1.53	800	1800	2.56	1.75	.77	.77	-	-	-	-	.44	.39	.13	.17
DENVER	IT	IT	1.67	1.86	600	1350	1.48	1.15	1.15	.87	-	-	-	.13	-	.21	.17	.23
FT. WORTH	IT	6	1.67	2.15	600	1350	1.68	1.19	2.43	1.95	-	-	-	.13	.47	.42	.17	.30
PORTLAND	IT	IT	1.83	2.00	600	1350	2.19	1.87	1.15	1.05	-	-	-	-	-	-	.17	.23
OAKLAND	9	9	2.50	2.52	600	1350	1.16	.90	2.18	1.73	-	-	.30	.13	.93	.62	.17	.30
TOTAL			1.78	2.01	7583	15833	1.51	1.16	1.92	1.67	.03	.02	.13	.09	.33	.31	.17	.27

[illegible]			3.87	4.28	800	1800	5.67	5.74	.08	.21	-	-	-	-	-	-	.13	.39

[illegible]-13 (5-57) 1

IV. RECEIPT CONTROL

NSCO has recently instituted suspense files in Receipt Control on both the stowage and Philco-2000 posting operations. In very general terms, the stowage suspense operates as follows. After the incoming boxes have been opened and the material has been checked and formally received, one document, which is called the HIXX copy, remains with the material when it is sent to be stowed. All other documents related to the material go to Receipt Control. Of these, one becomes a suspense file entry. The HIXX and suspense copies have a key date entered on them called the Suspense Date, which is the formal receiving date. When the material is stowed, the HIXX copy is signed, dated, and returned to Receipt Control. There, the HIXX copy is matched with the suspense document by searching through the suspense documents having the suspense date which appears on the HIXX copy. Matched documents are then sent on for further processing.

The function of the stowage suspense file is to maintain a control on the stowage operation; i.e., is the material stowed (somewhere)? Theoretically, a suspense document which remains unmatched for longer than some period, such as 5 days, should be viewed as prima facie evidence that stowage is delayed or has not been performed correctly. Such cases should be followed up to either expedite stowage or find out what other difficulty occurred before too much time has elapsed. As such, the maintenance of a stowage suspense file is an excellent idea*.

A number of problems have arisen in connection with the stowage Suspense File, primarily in the area of matching failures. These failures are of two types:

1. The HIXX copy arrives, but a matching suspense document cannot be found. This suggests that one of the following may have occurred:
    a. Suspense copy did not arrive in Receipt Control if the suspense date shown on the HIXX copy is recent.
    b. Suspense copy may have been improperly filed; i.e., under a suspense date not matching the suspense date on the HIXX copy. This in turn may have been caused by a filing error or a failure to put the same date on the HIXX and suspense document.
    c. Error (oversight) in the manual processing of attempting to match the HIXX and suspense copy.

---

* We understand that other activities have been maintaining such files and that a BAT recommendation led to NSCO's initiating such files.

2. The suspense copy remains in suspense file; i.e., it is not matched with any HIXX copy. This may be caused by
    a. Failure of the HIXX copy to be returned from stowage.
    b. Error (oversight) in the manual matching of HIXX and suspense documents.
    c. Failure to key Suspense and HIXX copies to a recent date. In some cases, the key date entered on the HIXX and suspense documents may be 5-15 days earlier than the date on which the material is released for stowage and the suspense document goes to Receipt Control. Since suspense documents are filed by this key date, those with the date some days earlier than the date of filing will immediately appear to be overdue.

The NSCO suspense file operation was started in July, 1963. Including shipments from OSO and vendors, there is now, in terms of very rough estimates, an unmatched backlog of approximately 20,000 documents, made up of 12,000 overdue suspense documents and 8,000 unmatched HIXX documents. The numbers in themselves are not important -- the significant fact is that there are a huge number, in both absolute and relative terms, of unmatched documents, each of which indicates some type of error and should be investigated.

It is generally recognized at NSCO that the Receipt Control suspense operation is not functioning properly. The suspense file has shown that there is a stowage problem, however this was known before, although perhaps the size of the problem was not fully appreciated. The intent in installing the system was to provide a method for controlling the stowage problem. This the system is not doing -- not because it was poorly designed, but because it is not operating properly. Any case where a HIXX arrives in Receipt Control and cannot be matched to a suspense copy indicates a breakdown in the suspense operation -- not in the stowage. Furthermore, investigation of suspense copies which are overdue in being matched with a HIXX has shown that in many cases the material has been stowed properly-- in fact, this seems to be the case in a majority of the instances investigated. Such failures can also be viewed as a breakdown in the suspense operation.

A Receipt Control suspense file as a control on stowage is an excellect idea. What we have at NSCO is not an improper application; rather it is an improperly functioning control system. The control system itself is grossly out of control -- in fact, more so than the system it is to control! Our first job than must be to make the control system operate properly -- to bring it into control. After this is done, it can be used as a control on stowage -- not before.

The situation may be compared to an analogous industrial operation where we are filling jars of food on a fast moving packaging line with an allowed tolerance of ± ½ oz. in the packaged weight, but use a test scale having a 4 oz. tolerance to check the weight of sample packages. Based on the readings from this test scale, we make adjustments to the filling machinery. This is like the NSCO Receipt Control suspense file in that the control is much less accurate than the process being controlled. Instead of reacting to the meaningless readings of the control, we should first concentrate on making the control more accurate -- i.e., making the suspense file function properly. Once this has been done, we can adjust or improve the basic operation -- in our analogue, this is the filling process, at NSCO it is the stowage operation.

There are several approaches to improving the suspense file operation. Among these are the following:

1. Mechanization of the existing system, using punched cards and tabulating equipment.
2. Total follow-up on the backlog of suspense signals.
3. A detailed analysis of the system operation on a stage by stage basis, followed by system revision and controls as required.
4. Stage by stage control, on a sample or full population basis.
5. Tight control on a small segment of the operation with a total follow-up. As the operation of each segment improves, another segment is brought into the control system, while at the same time total control is maintained on the segments previously brought under control.

We do not believe that mechanization itself will improve the system operation. The nature of the existing difficulties seems to be such that they will not be resolved by mechanization -- in fact mechanization can itself introduce additional problems. Thus, instead of a reduction in problems, we may instead only have more problems occurring faster. This situation can be compared to mechanizing the operation of our inaccurate test scale -- it does not seem to strike at the heart of the difficulties. Once we have determined precisely the causes and brought the system into control, then mechanization may be suitable for reducing the work required.

On the other hand, it may turn out that the major causes of difficulty are the manual operations associated with the filing and matching of HIXX and suspense documents. If such is the case, mechanization may be the way to bring the system into control. The principal points we wish to make in this connection are that:

1. There is as yet no evidence that the major causes of the suspense difficulties can be eliminated by mechanization.

2. Mechanization itself introduces new problems.

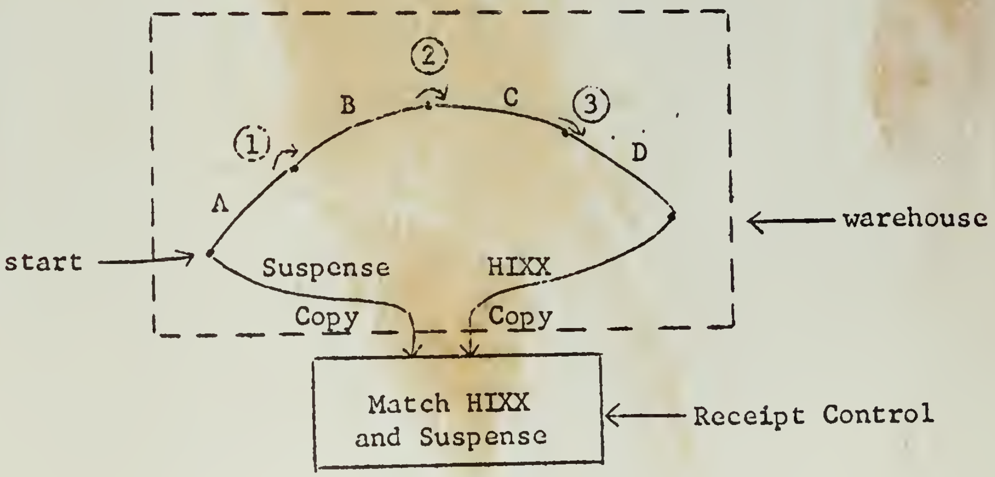
Accordingly, we should determine the basic causes of the problem before even considering mechanization.

The second approach suggests committing a huge effort to working through the backlog of suspense file signals. This does not seem to be advisable because:

1. We will be working with many old signals which, because of stock movement, cannot be resolved.
2. It is precisely the huge amount of effort this approach requires that has made it impossible to follow through on signals as they occurred.
3. It does nothing about getting to the heart of the difficulty and cutting down on the number of signals; thus our commitment would become continuous.

In summary, we do not recommend this frontal assault type of approach.

In comparing the remaining three approaches, it may be helpful to think of the stowage suspense file operation as a sequence of links A, B, C and as shown schematically below.



For instance, link D can be viewed as the return of the signed HIXX document from the stowage area to Receipt Control. The capital letters A, B, C, and D can be viewed as intermediate operations, or stages, and the numbers 1, 2, and 3 as transfers from one stage to another.

Then the third approach would be to make a careful study of each stage and connection to ascertain its performance characteristics and the factors within that stage causing problems. Based on this, controls and changes would be instituted as required. Such an approach would require a considerable effort expended over some period of time and might not lead to conclusive results.

Part of the difficulty here is that encountered in much industrial engineering work -- namely a segment which knows it is under observation improves in performance. Furthermore, when studying any one stage we do not really know how the whole system is performing or what the contribution of any one stage is to the whole problem. Accordingly, we cannot determine in advance how precise or intense (and correspondingly, time consuming) our study must be. When we're all done, we may only have found out that each stage works very well, say with a performance level of 98% or better; however, the system performance may still be low. Assuming independence of each stage, the total performance may be as low as

$$\underbrace{(.98)(.98)(.98)(.98)}_{\text{4 stages}} \quad \underbrace{(.98)(.98)(.98)}_{\text{3 links}} = .85$$

or 85%. Furthermore, when we begin to consider all the special cases which occur, the actual system becomes appreciably more complicated than the simple four stage linear system sketched above. Thus the investment in effort will be large and the expectation of conclusive results low.

The fourth approach is related to the third and is distinguished here only because it was mentioned separately in conversation by personnel at NSCO. In essence, it amounts to implementation of what might be recommended by the first approach, without first going through the analysis. It involves a close, or total control, on stages which might lead to errors and a looser, or sample, control on stages relatively free of error. An example of total control would be to keep a tally sheet of just which items a warehouseman is to stow and then checking them off as he turns in a HIXX document. This would be a total control on the warehouse worker. Sample control would exist if we were to control with only a sample. Such controls, dealing with very small stages of an operation may be viewed as operating, detail, or micro controls. Anything along the lines of this fourth approach will require considerable effort for its regular operation. In order to keep this to a minimum, the study of the third approach is required.

In the last approach we select some warehouse area, say one or two floors of one of the bin storage buildings, and follow up all suspense signals related to this area. In particular, we would pull

1. All suspense documents dated five or more days prior to the current date.
2. All HIXX copies for which we have been unable to find, by the normal procedures, a matching suspense document.

We would then interrogate the SLIS, find the location for the FSN of these documents and separate those related to the area under study. Every one of these latter documents would be checked out. For instance, we would check unmatched HIXX's against the suspense file a second time. Unmatched suspense documents would be checked against HIXX copies. We might check the trays of prepunched receipt cards -- finding a card here may suggest that a HIXX or suspense document has already passed through ("illegally"). Similarly, we could check the contract files on receipts from vendors. We would check the pipeline of incoming HIXX and suspense documents and the bin storage area to find out if the material has been stowed.*

It will probably not be possible to resolve all questions; however, we would do everything that's possible to do so. Daily counts of the number of each type of problem, including those unresolved, would be maintained. Through such a program of careful and complete follow-up and tallying, we expect that

1. A number of error causes may be uncovered which will suggest appropriate changes and controls.
2. In accordance with general industrial engineering experience, performances will improve automatically as people in all stages of the system realize that their actions are being measured and that there is a serious intent to check each suspense question out in detail.

The net result should be a gradual reduction in the number of suspense signals from the study area. As this occurs, the follow-up effort can be extended to another area, while still continuing a complete follow-up on any signals originating in the first. It is crucial that control not be relinquished once it is achieved. If a segment which was brought under control tends to go out of control, follow-up efforts in this segment must be intensified to bring it back into control.

Suspense signals related to warehouse areas not yet under the tight control would be largely ignored -- as now seems to be the case. It is unfortunate that this must be, but with limited effort available, there is nothing else to be done. In any case, the effect will be no worse than previously. In the past, suspense and HIXX copies which have remained

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* For this we need some positive evidence of stowage. Currently, one copy (pink?) of the SLIS form is left in the bin when it isn't required for other reasons. Finding this copy can be taken as proof of stowage; however, its absence cannot be viewed as a stowage failure.

unmatched for some time have been released for regular receipt processing. This may have led to some difficulties with duplicate receipts, as discussed in the section dealing with duplicate transactions.

We have recommended this last approach to NSCO because:

1. We believe that the suspense system as initially prescribed is well conceived and that what is primarily needed is an intensive effort to make it work. The system is simple and should operate with a low error rate. The key to making it work is a close follow through on any problems, together with letting the operating personnel know of the seriousness and precision of this follow through.

2. For any study program, such as under the third and fourth approaches, it will be necessary to follow through on suspense signals. A capability for such follow through must accordingly be developed in any case. The recommended approach concentrates this on a manageable work segment.

3. It seems to us that it should be possible to properly operate the suspense control without any additional controls. We should avoid trying to put another hierarchy of control on an already fairly complicated system -- it must be possible to accurately receive and stow a box without a large number of errors. The recommended approach strikes us as the simplest since it imposes no new requirement; it merely states that NSCO should do what was originally intended by the suspense control, except that one segment is brought into line before going on to the next. This is a common technique in systems design and implementation. Certain components are held constant while others are adjusted as required; then one goes on to the other components*.

4. In following through on any problems, we will be attacking the causes directly without concentrating on any particular stage of the process and will quickly be able to determine the difficulties and required changes.

5. With its gradual conversion, the recommended approach requires the minimum possible efforts. The initial segment can be chosen to be small enough so that it can be monitored by the effort available. Only when this first segment is under control and we have spare monitoring capacity is another segment brought into review.

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* To use an old cliche, one "should learn to walk before he runs".

In summary, the recommended approach can be tailored to the effort available and offers the greatest return for the effort expended. It is the easiest to implement and promises the quickest return. There is no assurance that it alone will do the job, although we have high expectations that it will. If it doesn't, we are certain, through the careful follow through, to find what other changes are necessary. If the more intensive study and controls of the third and fourth approach are required, they can always be used later.

The recommended approach employs a concept we call functional control. We monitor the operation of the system at certain stages such as the ends of the system of links sketched before. Any signals (in this case, match failures) are researched back through the system. As such, this concept is analogous to that of management by exception. Functional control differs from operating control in that the span of the system controlled is generally much larger and that we are concerned with only exceptions. Some detail processing is required, of course, but nowhere near the amount required for an equivalent system of operational control.

Functional control systems are applicable whenever we believe that the basic system is under steady control with only random signals and little correlation in the system performance from one item to the next. As such, it is applicable to well defined paper and data processing systems. Operational control is required for systems in which exceptions are not purely random or the follow through procedure is difficult or expensive.

For instance, a poor application of functional control would be to check automobile manufacturing only by testing the assembled vehicle and checking back on the cause of failure of those which didn't pass. If the cause of the difficulty was in the gradual wear of the machines grinding the crankshaft, we would have a large number of useless cars and engines in various stages of manufacture before the problem was recognized. The cause here is non-random. In such an instance it would clearly be better to maintain an operational control on the grinding process so that the difficulty is located as soon as possible.

NSCO has implemented the recommended approach on a two floor bin storage segment and we have been working with NSCO in devising the implementation procedures and reviewing progress. Based on a few days of data, the suspense system is already improving in performance. In fact, not only has the study area improved, but there has been a general, though not proportionate, improvement throughout. The latest figures we have are the following:

	Number of Unmatched Suspense Documents	
Day	NSCO	Study Segment
1	-	45
2	660	38
3	827	114
4	587	39
5	422	29
6	247	17
7	258	11

At this time, no details are available on problems uncovered or the breakdown of signals by cause. We do know that so far there has been no evidence to suggest that the control system as initially designed cannot do the job -- all that seems to have been needed was a careful follow-up. There are some indications that the return of HIXX copies for multiline receipts may be somewhat of a problem. These initial results, while not conclusive, are encouraging. We expect that NSCO will soon consider this first segment to be under control and will then expand the study area to include another segment.

Some of the difficulty in returning HIXX copies may be due to the number of different forms which are used for this purpose. Depending upon the situation, the HIXX copy may be

a. DD250 for INSMAT inspected material from contractors.
b. Contractor shipping documents for material from vendors which is to be inspected at the destination.
c. Form 1348 (soft copy) with material from other supply officers.
d. A manually created form on material arriving without adequate identification.
e. A copy (white) of the SLIS interrogation type out, used particularly for multiline receipts (of type a and b with more than one item on the accompanying documents) and returned material.

These forms are filled out in a number of ways. The type e) documents are stamped "STOW COPY" to identify that the SLIS document should not be returned to Receipt Control. Other type e) documents, used with multiline receipts, are stamped "NO REC. DOC." to signify that there is no separate suspense document for these items -- instead they appear on the (multiline) suspense document.

Because of the variety of forms and cases, it may be that the stowage personnel fail to return the necessary HIXX copies on the one hand and may be returning the wrong ones on the other. Supporting this possibility is the difficulty we experienced in obtaining a consistent interpretation of the significance of "STOW COPY" and "NO REC. DOC.". Furthermore, some

of the detailed follow-up of suspense signals has indicated that multiline receipts may be involved in a disproportionately large fraction of the signals.

All of this suggests that failure to return HIXX documents may be caused by misinterpretation on the part of stowage personnel. To cut down this possibility, we suggest that when material is received and the suspense and HIXX copies separated, the document which is to become the HIXX copy be stamped "HIXX AND RETURN TO RECEIPT CONTROL" or "STOW, SIGN AND RETURN TO RECEIPT CONTROL" in bright, bold letters. This provides a clear directive to stowage personnel and requires no interpretation, such as is needed when stamps such as "NO REC. DOC." are used.

There also has been some difficulty with holding multiline receipts in suspense until all items on the receipt have been matched. This is done because such a receipt must be processed in its entirety. This latter requirement is probably mainly an accounting restriction -- the vendor is to be paid in one payment for all items covered on one set of shipping papers. It is expected that this problem will be alleviated as the general suspense operation improves. If necessary, the intensive follow-up can be next extended to deal with all multiline receipts held up because of unmatched suspense entries; in this way the many matched receipts will not be unduly delayed.

The foregoing has dealt with the stowage suspense file. A similar suspense control has been implemented for the DPD* posting operation. When the receipt documents are sent to DPD, the date of release is noted on the original suspense document and this then becomes a DPD suspense entry. When DPD posts the receipts, a response document is prepared to indicate that this posting has taken place. This response is returned to Receipt Control where it is supposed to be matched with the suspense file. A match failure is viewed as a DPD suspense signal and should be researched in the transaction ledgers.

The DPD suspense operation is working even more poorly than the stowage suspense and has almost ceased to operate. As of now there is an unmatched backlog of approximately 30,000 documents, with approximately 16,000 for vendor receipts and 14,000 for OSO receipts.

A DPD unmatched suspense entry differs from an unmatched stowage suspense entry in that no processing is being held up. Presumably the posting and transaction reporting has taken place. However, as with the stowage operation, there is no reason why the DPD suspense file should not function properly by clearing itself.

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* Data Processing Division

Unlike the stowage suspense file, we feel that the mechanics of the DPD suspense file are in themselves a source of difficulty. Documents in the DPD suspense file are sorted by document number, as are the response cards received from DPD. The variety of (invalid) formats used by NSCO in its receipt and response document causes problems in maintaining a proper ordering of the response documents. Document numbers may be given as N104 77834, N104 778340 or N1047783400. Since a strict sort procedure is used, the form of the document number determines its position in the response file. There are several other factors such as the response card format and interpretation which contribute to the difficulties.

Because of the mechanical difficulties and the effort required, not much attention is being given to the DPD suspense file; in fact, it may even be discontinued. As with the stowage suspense, we believe that the DPD suspense system is conceptually sound and that it may be an important control device. Before discontinuing the DPD suspense file, we feel that some effort should be devoted to improving its operation to see if it can be made efficient.

APPENDIX B

OTHER CONSIDERATIONS

> Portia: I can easier teach twenty what were
> good to be done
> Than be one of the twenty to follow
> mine own teaching.[1]

Chapter III examined not only the quality programs of the Sears, Roebuck and Montgomery Ward companies but also their production of quantity control methods. In the Navy Supply System, as indicated in Chapter II, there is little attention being paid to an effective quality program. Control of quantity, however, is another story.

At the present time the Bureau of Supplies and Accounts, OM Division, is directing a vigorous program designed to institute the employment of scientific standards at all stock points. Prior to the time of the inception of this program in 1959, the only "standards" utilized in a general sense were those historically arrived at through the work-measurement program and through the

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[1] W. Shakespeare, The Merchant of Venice, Act , Scene 2.

initiative of some enlightened supervisors and managers. When it became obvious that costs were going to be the basis for the allocation of funds and workload, those functions for which historical standards were already available were at least in the position of being able to provide a cost figure which was more than a "guesstimate."

The introduction of scientific standards was designed to solve these cost problems and to form a basis for practical budgeting as well as to provide management with a valuable tool for the scheduling of work and assignment of tasks. This was nothing new to industrial management--the scientific approach has been with us since the days of Taylor and Gilbreth. But to the Navy Supply System it was new, and, to some, welcome.

Prior to the end of the Korean police action, the Navy had not had any money pressure placed on its management function. Large procurements and building projects were examined fairly closely, but the employment of people in shipyards, air stations and supply activities represented a political football that no one in Congress cared to put too much foot into.

When funds became restricted to a marked degree after Korea, it became apparent, at least to the Supply System's management, that a more realistic approach must be made toward the justification of numbers of people on the rolls with specific attention to tasks.

The Methods Engineering Program (MEP) was the result.

The advertised approach was to be one of careful study of methods and procedures, effected by line management with the assistance of methods engineers, the establishment of standards of individual and group production through time and motion studies and the application of standard work unit measurements, the institution of a reporting system to measure effectiveness, and the use of these reports for management and budget (planning) purposes.

Incorporated in the general plan was extreme emphasis on the importance of (a) thorough indoctrination and education of operating personnel so that they would understand the intent of the program and would support it, and (b) painstaking examination of methods with operating personnel so that the best solution would be arrived at and agreed upon. However, at the Naval Supply Center, Norfolk, so little time was given to personnel involved in the program for the methods survey phase, that this and the indoctrination phase were neglected in the rush to set standards. Production personnel, particularly first-line supervisors, considered the methods engineers as "young smart-alecks" who were trying to impose their inexperienced ideas on old hands who had grown up doing this type of work, and generally distrusted the program and the people in it. True, this attitude was gradually overcome through pressure from military directors of divisions and through the time-proven expedient of shoulder-shrugging acceptance.

Was this true wherever standards were instituted? In order to answer that question, one section of the questionnaire mentioned in Chapter II was devoted to the Methods Engineering Program and employee reaction to it. The questions, with some of the answers to them, are as follows:

To the Planning Officer[1]

> What has been the general reaction (from the point of view of the methods engineers) on the part of storage personnel, in particular, to the "imposition"[2] of standards?
>
> NSD, Seattle
>
> At the onset of the Methods Engineering Program, storage supervision and personnel assumed a defensive and suspicious attitude toward the program and the standards that it established. Through a continuing and persuasive campaign involving a degree of give and take, a more favorable reaction has been obtained whereby storage personnel have generally found the standards to be fair, and storage supervision has found the standards to be accurate and useful. This change in reaction may be attributed, in part, to acceptance of the fact that the standards are "here to stay" and must be lived with.
>
> NSC, San Diego
>
> . . . The first reaction of storage personnel seems to be an attitude of resistance to change followed by a gradual acceptance of the program.
>
> NSC, Pearl Harbor
>
> . . . There was a period of some reluctance to adjust to the program at lower management levels (for example, the generation of production data has been

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[1] Under whom the MEP is conducted.

[2] "Imposition" was put in quotes deliberately to evaluate the reactions of the various officers involved.

taken as additional clerical effort instead of manpower control tool), but a more positive awareness of the benefits that can be derived from using MEP standards as a means of controlling manpower utilization is gradually developing at all levels of management.

NSC, Bayonne

MEP studies and standards at NSC Bayonne have been accepted without much difficulty by Storage Division supervisory personnel. In most instances, Storage personnel agree that MEP standards are good guidelines by which to work. Reluctance to accept staffing based on standards has been encountered from Storage Division supervisors. Once the staffing difficulties have been overcome, the Storage Division supervisors have found MEP standards to provide them with an effective management tool.

NSC, Norfolk

General reaction--good. Methods Engineering at this Center had, before going into storage, built a reputation for honesty and fair dealing. Consequently, personnel in storage have been receptive and very cooperative. They do not, generally speaking, consider standards an "imposition." Rather, they are a new and helpful tool to the supervisor and a means to stimulate competition between individuals and units. However, it should be pointed out that a definite weakness exists in the Program that the Center refers to as the "two-edged sword." That is, when a survey is completed and standards are installed, overstaffing is identified and removed. However, when at a future date a maintenance survey identifies the need for additional staffing due to increased workload, etc., the increase in staffing is not so easy to obtain. This is a problem which must be solved by BUSANDA. However, the potential harm to the Program resulting from lack of confidence on the part of operations personnel is apparent.

NSC, Oakland

It could be said that the current reaction of storage personnel to the "imposition" of standards is "generally" favorable. However, this is somewhat less than definitive since it does not take into consideration the differing attitudes that prevail at given levels of the storage organization. At the division and branch level, acceptance is unusually high. This has not always been true. The reaon for increased acceptance is believed to rest on the fact that they have "discovered" that engineered standards serve as an excellent means of exercising a greater degree of scheduling and controlling of work. At the leadingman level there is a lesser degree of acceptance, but considerably higher than existed two years ago. This is attributable to several factors. First, the leadingman has also discovered that work distribution is facilitated by availability of standards. Second, the deleterious effect on his work force which he thought would be brought about by the "imposition" of standards did not materialize. Third, any reductions in personnel which did occur were so gradual as to create no personal impact so far as his own pay level was concerned. Historically, contrary to common belief, the degree of nonacceptance has been found least among individual warehousemen. It is believed that this is basically for two reasons. First, the worker is closest to the methods engineers who are doing the measuring. The total time of this close relationship will run into months. This permits the individual to gain sufficient insight to remove the aura of mystery that he initially felt. This in turn dissipates natural fear of the unknown. Second, the majority of personnel want to produce at least an average day's work. At the same time he is aware of those who are not doing so. Therefore, he tends to welcome a better device for measuring productive effort.

To the Storage Officer, the following question was addressed.

What has been the reaction of storage personnel to the "imposition" of standards?

NSC, Pearl Harbor

It is not felt that the Engineered Time Standards are an "imposition." The standards in themselves promise to be an effective management tool. However, experience has shown that the methods improvements

recommended by the MEP analyst are in many cases trite and of little lasting significance. Further, the development of statistics to support these recommendations prove to be, in fact, an imposition. Many of the areas being surveyed will be changed drastically upon implementation of NSC Pearl's long range storage plan.

NSC, Norfolk

The program concept has been accepted willingly enough, but many of the individual standards are protested as unachievable. The emphasis in M. E. on high speed, mass production leaves little lee way for the extra time that makes a quality product. DD6s and letters of complaint have risen as the M.E.-based removals have risen and the normal issue picker's first reaction to a charge of poor quality work is to state that he doesn't have time to break standard let alone double check his work for count and neatness.

NSC, Seattle

No reaction by storage personnel because standards have been developed cooperatively by Storage Division supervision and Methods Engineers.

NSC, Bayonne

To say that installation of methods engineered standards was considered an imposition by line personnel is false. Management launched a training program prior to installation to familiarize key personnel with the program to overcome the general tendency to reject new innovations. The knowledge was eventually passed to the workers supported by Command promise of "no job losses" because of the program.

In general the standards have been well received particularly since Management has been successful in recommending awards for deserving employees on the basis of consistent productivity above that normally required of standards.

NSC, Oakland

> Method standards generally accepted, but time standards have caused considerable resentment. Personnel feel that "line items" are all that are desired, without consideration of accuracy, neatness or safety of material _or_ personnel.

To the Industrial Relations Officer, the following question was addressed:

> What has been the general reaction on the part of storage personnel to the "imposition" of standards and to methods engineers in general? I realize this is a tough question, but I'd like to get a feel for the problems--if any.

NSC, Seattle

> No complaints have been received from individual employees nor employee groups. This may be due to the fact that prior to installation of methods engineered standards, a training program was initiated to familiarize all personnel with the overall objectives.

NSC, Pearl Harbor

> . . . Warehousemen and stockmen were interviewed to determine their attitude toward the Method Engineers. It was the opinion of some of the personnel interviewed that the Methods Engineers did not have sufficient knowledge or experience in the warehousing and storage methods to make a valid survey. There also appeared to be a considerable resentment to the Methods Engineers performing time studies on the various steps with a view toward eliminating their jobs and the recommendations were of a minor nature.

At the Naval Supply Center, Norfolk, in an interview with Ernie Morgan, Deputy Director of the Industrial Relations Department, it was ascertained that no official reaction to standards in the form of protests by individuals or groups had

been experienced but that the departmental representatives had found a general feeling of distrust and resentment toward the Methods Engineers and a general lack of knowledge about the purpose of the surveys and the reporting systems.

What has this got to do with a Quality Control Program? Simply this: in the institution of a quality program, management may experience the same reaction from operating personnel and first-line supervision as it did with the M. E. Program. Instead of quantity, the inspectors will be investigating the quality aspects of a man's work. The following are quotations from prominent quality control experts in industry.

> One of the most difficult of management problems has been that of overcoming resistance to change. In one study, participation was used to attempt to bring output up to standard after a change in the method. Prior to the study it had taken eight weeks to reach standard under the new method. The study involved a control group (treated as in the past--a meeting explaining the change and answering questions), and an experimental group. In the experimental group, the reason why a change was necessary was explained--the need to meet competition. Then the group was asked what to do about it. They worked out the details of the change and voted to put them into effect at once. In the control group, output dropped drastically and showed no improvement at all by the end of the experimental period of 40 days. The experimental group had passed the pre-change output at the end of the second day, and by the end of the experiment was 14 percent above the pre-change output.[1]

Perhaps the managers in today's Navy might frown on the "taking of a vote," but, Professor Belcher continues, "Psychologists

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[1] D. W. Belcher, "Quality Control Without Conflict," _Industrial Quality Control_, (February, 1960), p. 8.

point out that participation is the key to the strongest kind of motivation--that which comes from the individual who understands and accepts the goals to be achieved."[1]

Today, we hear a great deal about "identifying" with a group, a movement, an organization or another individual. Automation and the mechanization of clerical work tend to break the tie between the employee and the purpose or goal of the organization of which he is a part. In his covering letter to the answers to this thesis' questionnaire, Rear Admiral S. Sherwood, Commanding Officer of the Naval Supply Center at Pearl Harbor, states, in part,

> In addition to the enclosed information I'd like to express a thought or two. In discussions with warehousemen and stockmen over the past several years, they have made the statement that there is a loss of pride in their work. This stems from mechanization in that they have very little contact with the customer. They spend their time pushing boxes with papers that are filled with numerical digits. We have eliminated nomenclature from the document, the warehouse stock tally card, etc. They are criticized for most of the mistakes even though they have no control over the accuracy of document posting. They have no means of their own to prove that an error was due to someone else. This grows out of the cases where the variance between stock and stock record cannot be verified. We can't afford the manpower of a manual system and we can't retrogress. However, this psychological situation does exist and must be met.

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[1] Ibid.

Combine these remarks with that of Commander McKenna--"We don't get the dope in time to do anything about it!" and we have a serious problem which promises to grow unless steps are taken to solve it. The psychological effect of the advent of automation plus the failure of the system to be objective enough to place blame where it belongs may well lead to dissatisfaction and result in the falling off of both quality and quantity of performance.

Admiral Sherwood mentions the loss of touch with the customer. Ralph T. Soule, in an article in the Industrial Quality Control Journal of May, 1961, says, "References in your selling and advertising (of SQC) that link his (the employee's) personal experiences as a purchaser to those of your company's customers have an unusually strong appeal."[1] In other words, if the employee cannot, because of the system, have contact with the customer, perhaps the answer might be to put him in the place of the customer so that he would ask himself, "How would I like to get a box of the wrong sized bolts?"

There are two phases to the institution of any program insofar as the employees involved are concerned. First, the selling phase, and second, the application phase. Experience with the Methods Engineering Program and with any program involving a

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[1] Ralph T. Soule, "Developing Quality Consciousness," Industrial Quality Control, (May, 1961), p. 13.

change, indicates that the more important phase is that of selling. Participation, identification and faith,perhaps these are the keys to successful selling.

> If we consider a factory as a "culture," and this is no stretch of the imagination, we must consider this group of people--their way of thinking and acting under present conditions--and then consider what effects a technological change would have on this "culture." Certainly, a quality control program would be a technological change. . . . Most significant, by far, would be the resistance to change that the quality control program would meet from the people. . . . Bear this in mind, that any quality control program that does not take into consideration its effect on the people is almost sure to fail.[1]

And as his steps to preventing such failure, Herman Karleback continues:

> 1. Secure active participation by soliciting the assistance of those people who will be affected by the new program during the initial planning and implementation and thereby create a favorable climate for the change.
>
> . . . .
>
> 3. Select a small area where trouble importance and reception to new thinking is high. Try to reduce the impact of the change by persuasion rather than authority. Allow the new system sufficient time to spread its way into the broader thinking and acting in the shop.[2]

Perhaps the order should be reversed: first, select a group or function where success will be assured and then do a thorough selling job, the most effective method being to encourage

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[1] Herman Karleback, "Human Relations Problems Encountered in Quality and Reliability Control, Industrial Quality Control, (December, 1961), p. 27.

[2] Ibid.

participation. After all, in organizing a modern quality control function, the first principle to recognize is that quality is everybody's job.[1] Speaking to managers, Mr. Soule has this to say,

> An ever-present danger to every quality program is that it will become shipwrecked on the rocks of employee indifference. . . . When we realize the limitless scope of potential thoughts and the limited capacity of any individual to concentrate on any single subject, it is quite apparent that creating or establishing quality consciousness calls for an organized and sound approach. . . . Operating in manageable and well-defined areas, the supervisor should be your personal emissary in the mission of selling quality. . . . Maintaining the supervisor's interest and enthusiasm is just as important as his thorough indoctrination . . . advertising . . . a potent force and it can and should be used aggressively to advance quality consciousness in your plant. . . . Every bit of quality advertising and promotion that you undertake reaffirms the supervisor's faith in management's sincerity. Such advertising makes his personal job infinitely easier and more effective. . . . Too often the employee thinks only in terms of his job and his company. Help him to understand that without the customer there would be neither job nor company. Carry the case a step further and speak to him in terms of the satisfied customer. . . . Advertising, including that designed to sell quality, needs initial impact and frequent change. It can never be allowed to grow static. . . . But if you can convince them (the employees) that quality affects their jobs, their security, or their personal welfare, the acceptance you seek is in sight. . . . Don't let your production performance conflict with your quality consciousness program. Rush orders, get-it-out-the-back-door-in-any-fashion can make a mockery of your quality effort with employees. Let the keynote be CONSISTENCY.[2]

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[1] Feigenbaum, op. cit., p. 98.

[2] Soule, op. cit., p. 13.

Selling the program, then, involves selling it, first, to supervisors who, in turn must help sell it to employees. Consistency and the development of trust in management's sincerity are essential if the program is to be maintained.

One method of advertising and selling that was considered in Chapter IV is the display of the control chart. That chart must be to the employee a source of pride, a challenge, and a record of achievement. If the approach is incorrect, the chart will mean another mark of management's distrust of the employee. The use of the error slip can have the same effect if not introduced properly.

Professor Belcher, after conducting a survey of various quality control programs, stated that

> It hardly needs mentioning that the knowledge of the results available to employees brought about an immediate improvement in quality. . . . In furnishing knowledge of results, whether to employees or supervisors, the quicker the better. The sooner results are known after their occurrence, the better the results.[1]

This parallels Commander McKenna's argument.

Phase one, the selling stage, and phase two, the application: each is of significant and lasting importance. The purpose of the program is to improve the quality of the product,

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[1] Belcher, op. cit.

and this is possible only through the efforts of the people performing those functions which provide the data which are utilized by both the automated handling systems and the computer.

> Quality Control is not a police action . . . not a "cure-all" . . . not the belittling of the other functional elements of our business activity. . . . Quality Control is a management philosophy and objective . . . a cost reduction program . . . and . . . we must develop further our ability to sell the Quality Control and reliability function and philosophy . . . to our management and our fellow employees.[1]

A. W. Wortham, Director of Customer Relations with Elliott Service Company, Incorporated, proposes this approach to solve the selling problem:

> Somewhere deep within every man and woman in your plant is a hidden chord responsive to the quality story. Just what particular appeal on which undetermined day will cause it to sympathetically vibrate, is something no one can foresee. But by your efforts, by your diligence, by your faith in the cause of quality it will happen. When it does happen to a sufficiently large number of employees, you will have successfully established quality consciousness and thereby vastly improved your company's competitive position in the economy.[2]

Quality of both method and people is a direct aim of the approach outlined in Chapter IV. When the quality assurance inspector finds an error and returns the item with a correction

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[1] A. W. Wortham, "Management Development Through Quality Control," Industrial Quality Control, (June, 1961), p. 5.

[2] *Ibid*., p. 13.

slip to the supervisor in charge of the employee who made the error, the result should be constructive. Thorough explanation should be followed by retraining and reworking of the transaction. This directly affects the quality capability of the people doing the work.

The Control Chart and the reports which support it, should indicate to management not only when an operation is out of control but what attributes are causing it to go out of control. When these are investigated it may be found that people or a person is at fault. On the other hand, it might be the method that is causing the trouble. Thus, the control chart forces management continually to review methods and procedures and to keep them up to date and most efficient.

Methods are subjected to further study because of the nature of control charts. When the first, large sample is taken, the percent defective is often much greater than management considers acceptable. After the first few weeks there appears a marked improvement in quality, but this soon levels off, often at a level still below what management desires. However,

> the control chart can do no more than show what is going on, what has gone on in the past, and, sometimes, what may occur in the near future. It can only give signals for someone to act upon. Successful use of control charts require skillful reading of the signals, and prompt action when it is indicated.[1]

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[1] Zobel, op. cit., p. 11.

The chart itself is like a thermometer which shows the temperature but can do nothing to change it.

What management can do to effect the percent defective is change some of the ingredients of the process. Tighter control will have little effect. A change of methods, procedures or people is required to improve the quality of the process and product.

Changing methods or degree of productive capability of people (through training) is one thing. Changing people is another. In the civil service, it is not an easy matter to fire someone because he does not quite meet the standards expected of him. What is "a fair day's work?" In the Methods Engineering Program BuSandA management is beginning to acquire a capability for measuring productive output of employees and for comparing this measurement with a standard.

What the procedure in Chapter IV provides is a measurement of an employee's quality of output. The control chart will produce the standard for the function. A comparison of the two should not only provide management with tools for retraining erring personnel but also for evaluating them over the course of a year. Thus, when personnel continually fall down in either or both factors (quantity and quality) management will have documented grounds for dismissal. Then, when a reduction in force occurs, supervisors who have utilized these tools will no longer

have to stand by helplessly while their younger, more promising people walk out the gate because of lack of seniority. The problem will have solved itself through effective use of standards to clean out the nonproducers.

There is no intent, here, to imply that younger people are better workers than older ones. The facts are that a great majority of our civil servants are past middle age. At the Naval Supply Center, Norfolk, as an example, the average age is 47 years.[1] Consequently, there are more older nonproducers than younger ones, and, with funds being cut and staffing reduced two and three times a year; with seniority the major, if not the only, factor affecting retention, the situation cannot help but get worse. The need for young people for the future must be met. The objectivity of the use of standards of quantity and quality may force supervisors to meet it.

One final word about two other considerations of a complete Statistical Quality Control Program. Commander McKenna, in answer to the question,

> What methods (if any) are used to assure the quality of work performed by storage warehousemen? (Inspection by supervisors, sampling, etc.)

said,

> We feel this is a most imperfect program at this stage because (1) some minor areas are over-sampled while others have never been touched at all, and (2)

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[1] Figures provided by the Services Division, Material Department, Naval Supply Center, Norfolk.

> the sampler's lack of knowledge or experience in knowing good from bad, e.g., some items passed by the sampler resulted in DD-6's,[1] many discrepancies are so minor that an inordinate amount of management time is wasted in research. (Attached are examples of forms utilized by various stock points to grade the quality of an individual's performance.)

The problem of accurate sampling might be solved by assigning experienced operating personnel permanently to quality inspection. In addition,

> SQC procedures can be useful in dealing with returns and field complaints, particularly if good production records and inspection records are kept. Not only will a statistical approach toward an analysis of returns and complaints pay off in pinning down real field quality problems as distinct from illusory problems, but it will also aid in determining the basic causes of real complaints and signal where in the production stream important quality lapses may be taking place, so they may be prevented or minimized in the future.[2]

As for the problem of over-and-under sampling, the jewels in a watch are there for a purpose: to ensure reliable performance by reducing wear at key points.

> It is precisely the same with a quality control system. A minimum number of control points is required for an adequate system; but is quite possible to go overboard and design a system which contains so many controls that some of them represent wasted effort. The sensitivity and complexity of the mechanism dictate where and how many controls are required.[3]

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[1] DD-6--Report of Damaged or Improper Shipment.

[2] Zobel, op. cit., p. 11.

[3] Ibid., p. 9.

The initial sampling of a process determines whether further controls are required. If the percent defective is acceptable, the establishment of daily sampling would be too expensive. It is where the defective is not acceptable that controls are required. The acceptable areas should, however, be subject to occasional sampling to assure that they do not retrogress.

At Norfolk, the main reason for the original suspension of the Quality Assurance Program was lack of people resulting from reduction of funds. People, then, are the key to the problem. Says J. J. Daly,

> To be completely realistic, there are only two things which can be used to determine the number of people required by quality control. First, the degree of sophistication of design and second, the quality actually being produced. . . . It is axiomatic that the poorer the quality the more inspectors.[1]

In the Navy Supply System, design is not too much a problem. Quality of service is, and if the trend toward emphasis on production continues, this quality will inevitably go down unless people are made available to do something about it. It is management's problem to see that the right number are assigned to the Quality Assurance Division. It is also management's responsibility to promote the acceptance of this program and of the people responsible for implementing it.

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[1] Daly, op. cit., p. 11.

As the attached examples illustrate, the present method of measurement of the quality of performance of individuals is completely subjective. The utilization of the control chart along with the use of error or correction slips similar to those attached to Exhibits 3 and 4, can provide management with the tools for objective measurement and, if correctly applied, give employees a standard against which to strive and the satisfaction of knowing when a job is well done.

Portia: Nothing is good, I see, without respect.[1]

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[1] W. Shakespeare, _The Merchant of Venice_, Act V, Scene 1.

NSD NEWPORT

PERFORMANCE RATING REPORT
NAVEXOS-3238C (5-58)

KIND OF RATING ☐ OFFICIAL ☐ UNOFFICIAL

RATING PERIOD FROM TO

EMPLOYEE NO.

EMPLOYEE NAME

JOB TITLE AND CLASSIFICATION

NAME AND LOCATION OF ACTIVITY

ORGANIZATIONAL LOCATION OF JOB

FOR WHAT PART OF THE RATING PERIOD HAVE YOU SUPERVISED THIS EMPLOYEE? FROM: TO:

√	RATING FACTORS AND SUBFACTORS Rate only pertinent subfactors under each factor. On left margin, check the subfactors that are most important. Mark summary evaluation on Factors I, II and III for all jobs. Mark Factor IV only when applicable.	NA - NOT APPLICABLE OR NO - NOT OBSERVED	*EVALUATIONS OF PERFORMANCE (Check) UNSATISFACTORY	SATISFACTORY LOW SATISFACTORY	SATISFACTORY MEETS NORMAL STANDARD	SATISFACTORY HIGHLY SATISFACTORY	OUTSTANDING
	FACTOR I. ADAPTABILITY ON THE JOB AS A WHOLE						
	1. APPLICATION TO DUTY (CONSERVATION OF TIME)						
	2 OBSERVANCE OF RULES (CONDUCT, SAFETY, ETC.)						
	3 COOPERATION WITH SUPERVISORS						
	4 RELATIONS WITH FELLOW WORKERS						
	5 ATTITUDES; WILLINGNESS TO LEARN						
	6 MAINTENANCE AND USE OF KNOWLEDGES AND SKILLS						
	7 DEPENDABILITY						
	8 INITIATIVE AND RESOURCEFULNESS						
	9 CONSERVATION OF MATERIALS						
	VERSATILITY						
	EFFECTIVENESS IN ORGANIZING						
	DECISIVENESS						
	LEADERSHIP						
	GENERAL ADJUSTMENT TO CONDITIONS OF WORK						
	OTHER:	X X X					
	FACTOR II. QUALITY OF WORK						
	16. ACCURACY AND THOROUGHNESS OF WORK						
	17. NEATNESS, PRESENTABILITY AND ACCEPTABILITY OF WORK						
	18. SOUNDNESS OF JUDGMENTS AND DECISIONS						
	19. EFFECTIVENESS IN PRESENTING IDEAS OR FACTS						
	20. EFFECTIVENESS IN MEETING AND DEALING WITH PEOPLE						
	21. OTHER	X X X					
	FACTOR III. PRODUCTIVENESS						
	22. AMOUNT OF ACCEPTABLE WORK PRODUCED						
	23. MEETING REALISTIC DEADLINES						
	24 SPEED OF WORK						
	PROMPTNESS OF ACTION						
	26 PROGRESS TOWARD MEETING OBJECTIVES OR SATISFYING DEMANDS FOR ACTION						
	27. OTHER:	X X X					
	EFFECTIVENESS IN SUPERVISING, PLANNING AND ADMINISTERING (*Attach Form NAVEXOS-3238E for subfactors under this factor*)						

SUPERVISORY EVALUATION ☐ U ☐ LOW S ☐ NORMAL S ☐ HIGH S ☐ O

**ENTER COMMENTS REGARDING PERFORMANCE IN SPACE PROVIDED ON REVERSE SIDE (or on attached sheet).*

CHECK SUMMARY ADJECTIVE RATING: ☐ OUTSTANDING ☐ UNSATISFACTORY IF NOT CHECKED, RATING IS SATISFACTORY.

(For Outstanding or Unsatisfactory rating, justification and performance standards must be attached.)

RATER'S SIGNATURE	DATE	RATING DISCUSSED WITH EMPLOYEE (*Signature*)	DATE DISCUSSED
REVIEWER'S SIGNATURE	DATE	DISCUSSION ACKNOWLEDGED BY EMPLOYEE (*Signature*)	
RATING APPROVED (*Enter adjective if changed*)	DATE	COPY OF RATING FURNISHED EMPLOYEE BY (*Signature*)	DATE

NOTICE TO EMPLOYEE -- By this copy of your performance rating you are notified of the rating and its contents. If you feel this rating is not correct in every particular, you may within 10 days after receipt of this notice request an impartial review and any

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PERFORMANCE RATING REPORT
NAVEXOS-3238E (5-58)

KIND OF RATING
☐ OFFICIAL ☐ UNOFFICIAL

RATING PERIOD
FROM. TO:

EMPLOYEE NO.

EMPLOYEE NAME

JOB TITLE AND CLASSIFICATION

NAME AND LOCATION OF ACTIVITY

ORGANIZATIONAL LOCATION OF JOB

THIS SHEET IS A SUPPLEMENT TO PERFORMANCE RATING REPORT, NAVEXOS-3238C

	RATING FACTOR NO. IV. EFFECTIVENESS IN SUPERVISING, PLANNING AND ADMINISTERING Rate this factor only for supervisory, planning, and administrative positions. Rate only on subfactors pertinent to job. On left margin, check the most important subfactors.	NA – NOT APPLICABLE OR NO – NOT OBSERVED	•EVALUATIONS OF PERFORMANCE *(Check)*				
				SATISFACTORY			
			UNSATISFACTORY	LOW SATISFACTORY	MEETS NORMAL STANDARD	HIGHLY SATISFACTORY	OUTSTANDING
✓	INDICATE HOW EFFECTIVE EMPLOYEE IS IN:						
	28. [illegible]ING OUT WORK, AND ESTABLISHING STANDARDS OF PERFORMANCE, [illegible] SUBORDINATES. (INCLUDES DEVISING ADEQUATE STANDARDS AND KEEPING STANDARDS UP TO DATE.)						
	29. INSTRUCTING, TRAINING AND DEVELOPING SUBORDINATES.						
	30. KEEPING SUBORDINATES ADVISED OF THINGS THEY SHOULD KNOW.						
	31. CREATING SUPERVISOR-EMPLOYEE TEAMWORK AND TWO-WAY COMMUNICATION.						
	32. ESTABLISHING CONDITIONS CONDUCIVE TO WORK ACCOMPLISHMENT.						
	33. SETTING AND OBTAINING ADHERENCE TO TIME LIMITS AND DEADLINES.						
	34. DIRECTING AND REVIEWING THE WORK OF SUBORDINATES.						
	35. PROMOTING HIGH WORKING MORALE. (INCLUDES GIVING DESERVED RECOGNITION AND APPROPRIATELY SUPPORTING SUBORDINATES.)						
	36. DELEGATING CLEARLY DEFINED AUTHORITY TO ACT.						
	37. DETERMINING (OR RECOMMENDING) SPACE, PERSONNEL AND EQUIPMENT NEEDS.						
	38. DEVISING PROCEDURES.						
	39. PLANNING PROGRAMS.						
	40. ADAPTING WORK PROGRAM TO BROADER OR RELATED PROGRAMS.						
	41. OTHER: (1) ____ (2) ____ (3)						
	SUMMARY EVALUATION ON FACTOR NO. IV.						

•COMMENTS – *enter below: (Refer to instructions on Form NAVEXOS-3238C (Trial Form 5-58).)*

PERFORMANCE APPRAISAL SHEET
IND-GEN-250 (Rev. 7-56)

NSD Newport.

EMPLOYEE'S NAME

JOB TITLE

DEPT., SHOP & UNIT/DIVISION

CS NO./PD NO.

ADJ RATE

1. Opposite each applicable statement, check the block containing the performance description that most nearly represents the employee's characteristic performance.

2. Base your judgement on the entire period covered and [illegible] recent incidents alone, taking into consideration [illegible] not the employee is improving.

PERFORMANCE EVALUATION (Employee init. each Quarter)

		1ST QUARTER					2ND QUARTER					3RD QUARTER					4TH QUARTER				
		INITIALS					INITIALS					INITIALS					INITIALS				
		DATE					DATE					DATE					DATE				
		ALWAYS	75% OF THE TIME	50% OF THE TIME	25% OF THE TIME	NEVER	ALWAYS	75% OF THE TIME	50% OF THE TIME	25% OF THE TIME	NEVER	ALWAYS	75% OF THE TIME	50% OF THE TIME	25% OF THE TIME	NEVER	ALWAYS	75% OF THE TIME	50% OF THE TIME	25% OF THE TIME	NEVER
PART 1. QUANTITY OF WORK	Completes all assigned work within time limits.																				
	Completes all assigned work without sacrifice of quality.																				
	Completes assigned work and does not "kill" time.																				
	Volunteers for and produces more than assigned work.																				
	Completes assigned work in advance of time limits.																				
	Meets short emergency deadlines.																				
	Adopts exceptionally effective short-cuts.																				
	Sets example for other employees in his shop/section.																				
	Shows a willingness to work diligently on all jobs assigned to him.																				
	Produces more/less work than fellow workers.																				
	Keeps routine work on a current basis.																				
	Recognizes and gives proper priority to work.																				
PART 2. QUALITY OF WORK	Work completed in "top quality" in its field.																				
	Turns out accurate work.																				
	Eliminates safety hazards and maintains safe working conditions.																				
	Work produced does not result in discrepancies.																				
	Simplifies his work to greatest extent possible.																				
	Makes every effort to prevent and eliminate bottlenecks in work flow.																				
	Does not indulge in horseplay, endangering the safety of others.																				
	Complies with all safety rules and regulations.																				
	Demonstrates keenness, recognizes a better or more correct course of action, and takes action to accomplish the work more speedily, safely and effectively.																				
PART 3. ADAPTABILITY	Works harmoniously with fellow workers.																				
	Interested in learning and takes the initiative to improve job knowledge and skill, is given assignments requiring solution of problems unusual to the work involved.																				
	Makes sound, correct decisions on problems arising as a result of his work.																				
	Performs all his own work and other necessary work with a minimum of supervision.																				
	Exhibits a very strong desire to advance himself.																				
	Exhibits leadership by his ability to assist and influence personnel.																				
	Plans his work efficiently and is dependable.																				
	Appreciates rules established by management and applies them willingly.																				
	Sets example in his work group in terms of interest in job, and loyalty to work group, resulting in favorable group spirit.																				
	Accepts assignments and instructions readily.																				
PART 4. OTHER FACTORS	Has annual leave approved in advance.																				
	Is not involved in incidents of sick leave abuse.																				
	Makes valuable suggestions (written or verbal) to improve working conditions, save Government funds, etc.																				
	Work results are worthy of recognition, (written or verbal).																				
	Abides by rules re hours of work.																				
	Follows established procedure in seeking redress or solution to problems.																				

EXHIBIT

QUALITY OF WORK

Regardless of HOW MUCH work he does - HOW WELL does he regularly do what he does?

SUB-FACTORS TO CONSIDER:

Accuracy - thoroughly - neatness - presentability and acceptability.

Demonstrated skill and training - speaking ability - writing ability.

Soundness of judgments and decisions.

Avoidance and reduction of waste.

Degree of conformance to prescribed quality standards.

EXAMPLES OF HOW TO ANALYZE THESE SUB-FACTORS:

Acceptability

________ Careless; many errors; work slipshod. Quality below minimum requirements. Assignments always need correcting. Close checking and repeated follow-ups necessary.

________ Work fairly thorough and complete. Work must be checked for thoroughness and frequently must be repeated before it can be accepted.

________ Usually work is accurate, neat, thorough and complete. Does a good quality job without extra supervision. Meets or exceeds standard requirements. Makes few mistakes. Assignments supervised moderately.

________ Work exceptionally accurate, neat, thorough and complete in all details. Exceptionally high quality. Unusually accurate and thorough, with minimum spoilage. Assignments correct and completed almost entirely on own initiative.

Skill and training

________ Exhibits poor training for the job. Inadequate knowledge. Weak in applying knowledge. Needs too much supervision. Has difficulty in expressing himself. Lacks coherency. Definitely lacks ability to write. Poor sentence structure and thought sequence. Rambles.

________ Fair training for the job, or has acquired fair knowledge through study and experience. Speaking ability fair but lacks assurance. Tends to diverge from subject and confuse issue. Written material nearly always requires rearrangement of text and correction in style and grammar.

________ Has good training and experience for all elements of the job; knows the job well. Well informed. Knows the usual operations. Applies knowledge and experience well. Needs very little supervision. Usually satisfactory in speaking with occasional need for supervisory help. Writes well. Good thought sequence briefly expressed. Occasional changes required.

________ Exhibits excellent knowledge and superior training for all elements of the job. Exceptionally well informed. Sound and broad knowledge of his job and matters related to it. Applies knowledge and experience unusually well. Needs practically no supervision. Exceptionally good in oral expression. Can speak well to anyone and everyone. Written material is clear, concise and cogent; gauged perfectly to achieve the effects desired.

Judgments and decisions

Just how sound are his suggestions, recommendations, interpretations, decisions? Usually incorrect? As frequently incorrect as correct? Usually correct? Rarely incorrect? Does he have foresight - anticipate changes in conditions or probable events? Is his reasoning logical and analytical? Does he recognize factors involved and give proper weight to them? To what extent are his judgments adjusted, reversed or reviewed?

BIBLIOGRAPHY

Play

Shakespeare, William. The Merchant of Venice.

Public Documents

Bureau of Ships. A Guide to Quality Assurance in Shipyards, Nav Ships 250-706-34, Washington, D.C.,:Navy Department.

Bureau of Supplies and Accounts. BUSANDA Notice 4440, Washington, D. C.: Navy Department, October 25, 1963.

Bureau of Supplies and Accounts. BUSANDA INSTRUCTION 4440.91. Washington, D.C.: Navy Department, June 1, 1962.

Bureau of Supplies and Accounts. Uniform ADPS Support Procedures Handbook. NavSanda Publication No. 420, Washington, D.C.: Navy Department, 1963.

Department of Defense. "Quality Control System Requirements," MIL-Q-9858, April 9, 1959.

Department of Defense. Quality Control and Reliability Handbook (Interim), H-110, Evaluation of Contractor Quality Control Systems, December 31, 1960.

Department of Defense, MILSTD 105-D, Sampling for Attributes,1962.

DOD Operating Manual MILSTRIP, September 1, 1961.

Naval Supply Center, Norfolk, Virginia. "Operation Storekeeper."

Books

Albers, Henry H. Organized Executive Action. New York: John Wiley & Sons, Inc. 1962.

Grant, E. L. Statistical Quality Control. New York: McGraw-Hill Book Company, Inc. 1952.

Lazzaro, Victor. Systems and Procedures. Englewood Cliffs, N.J.: Prentice Hall, Inc., 1959.

Philipson. Automation Implications for the Future. New York: Vintage Books, Random House, 1962.

Shewhart, W. A. Economic Control of Quality of Manufactured Product. New York: D. Van Nostrand Co., 1931.

Articles and Periodicals

Anderson, Webster. "A $2,000,000,000.00 Quality Operation," Industrial Quality Control, October, 1960.

Belcher, D. W. "Quality Control Without Conflict," Industrial Quality Control, February, 1960.

Bourquin, James F. "Uses of Total Quality Control in Top Management Decision Making," Industrial Quality Control, February, 1959.

Budin, Morris. "A Problem in the Control Function of Management," Advanced Management, January, 1958.

Daly, J. J. "Two Magic Words," Industrial Quality Control, November, 1961.

Feigenbaum, Armand F. "Total Quality Control," Harvard Business Review, November-December, 1956.

Gowran, Clay. "Quality Control--New Key to a Good Car," The Washington Post. January 26, 1964.

Hansen, Morris H.; Hurwitz, William N.; and Gilford, Leon. Science in Management, (U. S. Bureau of the Census) ASQC 1959 Conference Proceedings.

Jerome, William Travers, III. "Executive Controls--What and Why," The Controller, November, 1956.

Kall, Harold L. "Does Your QC Organization Meat MIL-Q-9858?" Industrial Quality Control, November, 1956.

Karleback, Herman. "Human Relations Problems Encountered in Quality and Reliability Control," Industrial Quality Control, December, 1961.

Knowler, Lloyd A. "Fundamentals of Quality Control," Industrial Quality Control, July, 1946.

Riordan, John J. "Quality Control Management in the Department of Defense," Industrial Quality Control, December, 1959.

Soule, Ralph T. "Developing Quality Consciousness," Industrial Quality Control, May, 1961.

Wortham, A. W. "Management Development Through Quality Control," Industrial Quality Control, June, 1961.

Ziegler, Raymond J. "The Application of Managerial Controls in Selected Business Firms," Advanced Management, August, 1958.

Zobel, Sigmund P. "Quality Control from Front Door to Back Door," Industrial Quality Control, December, 1960.

Unpublished Material

Romberg, Bernhard W. "Working Memorandum No. 1," New York: Arthur D. Little, Inc., October 14, 1963.

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